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**DRAFT COMPREHENSIVE CONSERVATION PLAN  
AND ENVIRONMENTAL ASSESSMENT**

***FOR***

**LOWER HATCHIE NATIONAL WILDLIFE REFUGE**

*Lauderdale and Tipton Counties, Tennessee*

U.S. Department of the Interior  
Fish and Wildlife Service  
Southeast Region  
1875 Century Boulevard  
Atlanta, Georgia 30345

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## SECTION A. DRAFT COMPREHENSIVE CONSERVATION PLAN

# *I. Background*

### INTRODUCTION

Contained in this Draft Comprehensive Conservation Plan (CCP) for Lower Hatchie National Wildlife Refuge are the proposed management actions and direction for the refuge over the next 15 years. When fully implemented, this plan would strive to achieve the vision, goals, and objectives for the refuge developed by a planning team of representatives of government and private groups, as well as private individuals. Overriding considerations reflected in the plan are that fish and wildlife conservation requires first priority in refuge management and that wildlife-dependent recreation is allowed and encouraged as long as it is compatible with, or does not detract from, the mission of the National Wildlife Refuge System or the purpose for which the refuge was established.

In conjunction with CCP planning in west Tennessee, a collaborative planning process was performed simultaneously with the State of Tennessee. This joint planning study area included all of west Tennessee, from the Mississippi River to the Tennessee River, and from border-to-border between the States of Kentucky and Mississippi, encompassing approximately six million acres of private, State, and Federal lands, including national wildlife refuge lands (Figure 1, Focus area for west Tennessee planning effort). This cooperative planning effort is described more fully in subsequent sections of this document.

During the planning process, a range of four management alternatives was developed for Lower Hatchie National Wildlife Refuge that met the goals and objectives of the refuge for the next 15 years, as well as covered the broad spectrum of comments received by public and staff during the scoping process. After a review of the management needs of the refuge, regional and national resource management plans and priorities, and staff and public comments, the four alternatives were evaluated and a proposed action was then selected. The proposed action is described in Chapter V (Plan Implementation) of the CCP. The other alternatives considered during the planning process are addressed in the draft environmental assessment that is included in this document.

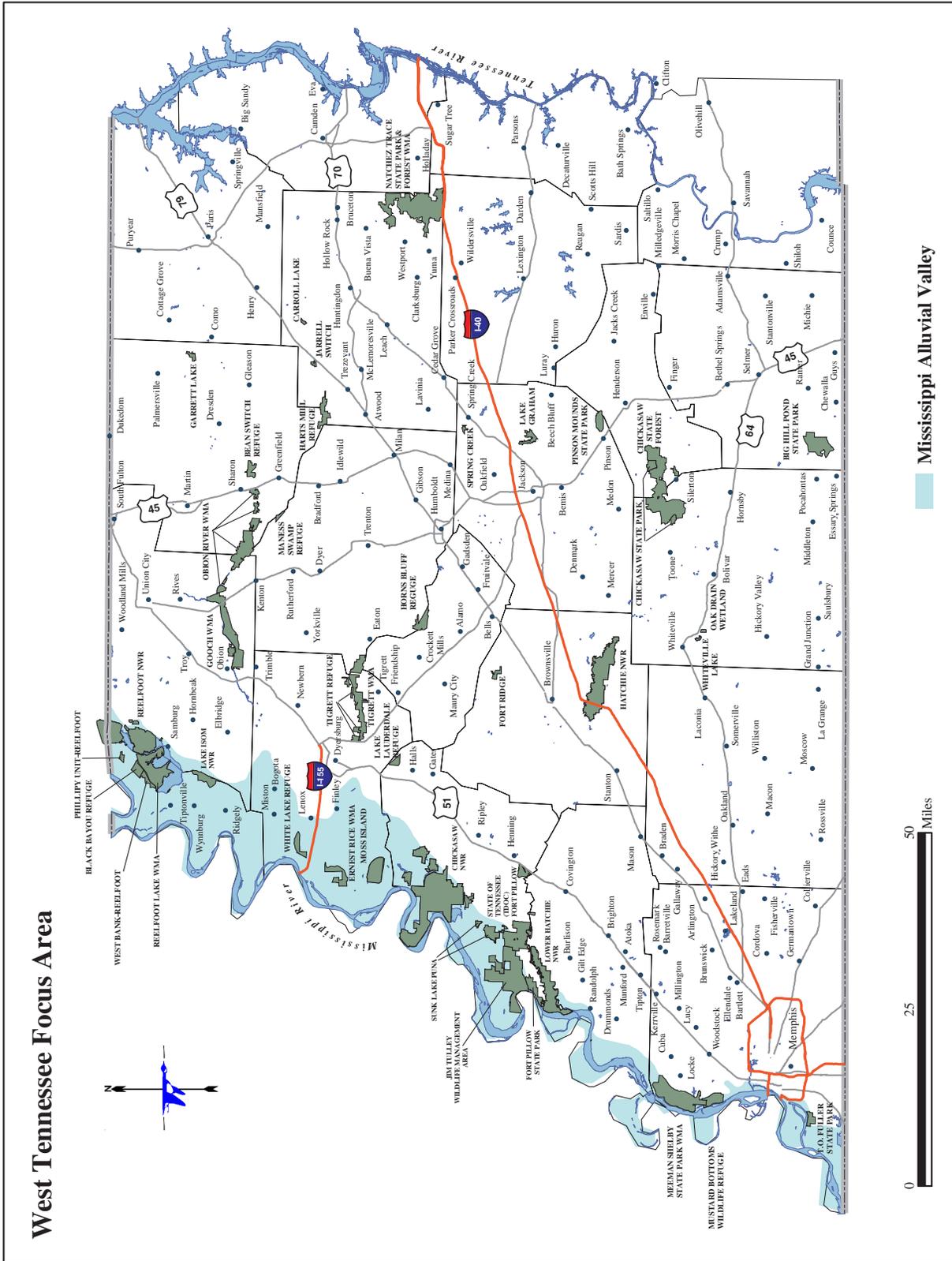
### PURPOSE AND NEED FOR THE PLAN

The purpose of the plan is to identify the role the refuge would play in support of the National Wildlife Refuge System and to provide guidance in refuge management activities.

The plan is needed to:

- Provide a clear statement of direction for the future management of the refuge;
- Ensure that management of the refuge is in keeping with the purposes for which the refuge was established;
- Provide refuge neighbors, visitors, and government officials with an understanding of Service management actions on the refuge and in partnerships around the refuge;
- Ensure that Service management actions, including land protection and recreation/education programs, are consistent with the mandates of the National Wildlife Refuge System, including the National Wildlife Refuge System Improvement Act of 1997;

Figure 1. Focus area for west Tennessee planning effort



- 
- Ensure that the management of the refuge is consistent with Federal, State, and county plans; and
  - Provide a basis for operations, maintenance, and capital improvement needs.

In an effort to better accomplish the mission of the National Wildlife Refuge System, the Service continues to work cooperatively and develop relationships with numerous agencies, organizations, and businesses. In keeping with this partnering concept, this draft CCP supports other significant regional, national, and international resource management plans, including the North American Waterfowl Management Plan; the Lower Mississippi River Joint Venture Project; the Lower Mississippi Valley Migratory Bird Wetlands Conservation Initiative; the National Wetlands Priority Conservation Plan; the Partners-in-Flight Initiative; the Western Hemisphere Shorebird Reserve Network; the Lower Mississippi River Ecosystem Plan; the Hatchie River Plan; Southeast Region Fisheries Strategic Plan (2004-2008), Tennessee Wildlife Resources Agency's SEG Plan, and the West Tennessee Wildlife Resources Plan.

## **U.S. FISH AND WILDLIFE SERVICE**

### *DESCRIPTION AND MISSION*

The Fish and Wildlife Service is the primary Federal agency responsible for conserving, protecting, and enhancing the Nation's fish and wildlife populations and their habitats. The Service also has specific trustee responsibilities for migratory birds, threatened and endangered species, anadromous fish, and certain marine mammals, as well as for lands and waters administered by the Service for the management and protection of these resources. For further information regarding migratory birds, see the Service website at <http://birds.fws.gov/>. The Service also shares some conservation responsibilities with other Federal, State, tribal, local, and private entities.

As part of its mission, the Service manages 550 national wildlife refuges covering over 96 million acres. These areas comprise the National Wildlife Refuge System, the world's largest collection of lands dedicated to wildlife conservation, with 77 million acres in Alaska and the remaining 19 million acres spread across the other 49 States and several island territories.

## **NATIONAL WILDLIFE REFUGE SYSTEM**

### *DESCRIPTION AND MISSION*

The mission of the National Wildlife Refuge System, as defined by the National Wildlife Refuge System Improvement Act of 1997, is "... to administer a national network of lands and waters for the conservation, management, and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

The National Wildlife Refuge System Improvement Act of 1997 established, for the first time, a clear legislative mission of wildlife conservation for the National Wildlife Refuge System. Activities were initiated in 1997 to fulfill the mission of this new legislation, including an effort to complete comprehensive conservation plans for all refuges. These plans, which are completed with extensive public involvement, help guide the management of refuges by establishing natural resources and recreation/education programs. The Act states that each refuge shall be managed to:

- Fulfill the individual purpose for which it was established;
- Fulfill the mission of the National Wildlife Refuge System;

- 
- Consider the needs of wildlife first;
  - Fulfill requirements of comprehensive conservation plans that are prepared for each unit of the Refuge System;
  - Maintain the biological integrity, diversity, and environmental health of the Refuge System;
  - Recognize that wildlife-dependent recreation activities, including hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, are legitimate and priority public uses; and
  - Allow refuge managers authority to determine compatible public uses.

Approximately 37.5 million people visited national wildlife refuges in 1998, most to observe wildlife in their natural habitats. As visitation grows, there are important economic benefits to local communities. Nearly 40 percent of the country's adults spent \$101 billion on wildlife-related pursuits in 1996, according to the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (U.S. Fish and Wildlife Service 1997). Volunteers also continue to be a major contributor to the success of the Refuge System. In 1998, volunteers contributed more than 1.5 million hours on refuges nationwide, a service valued at more than \$20.6 million.

In more recent studies, economists published "Banking on Nature" (USFWS 2003), an updated version of the 1997 report on the economic benefit of national wildlife refuges. The report found that in 2002, more than 35.5 million visits to national wildlife refuges fueled more than \$809 million in sales of recreation equipment, food, lodging, transportation, and other expenditures. That figure is more than double the \$401.1 million generated in 1995, the last time the study was conducted.

The wildlife and habitat vision for national wildlife refuges stresses that wildlife comes first; that ecosystems, biodiversity, and wilderness are vital concepts in refuge management; that refuges must be healthy; that growth of refuges must be strategic; and that the Refuge System serves as a model for habitat management with broad participation from others.

## **LEGAL POLICY CONTEXT**

Administration of national wildlife refuges is guided by directives from National Wildlife Refuge System policy, congressional legislation, Presidential executive orders, and international treaties. Policies for management options of the refuge are further refined by administrative guidelines established by the Secretary of the Interior and by policy guidelines established by the Director of the Fish and Wildlife Service. Management options of the refuge's establishing authorities, Public Law 104, (Stat. 2957, Section 108, H.R. 3338), and the National Wildlife Refuge System Improvement Act of 1997, the legal and policy guidance for the operation of national wildlife refuges, are contained in documents and acts listed in Appendix III.

Guidance and direction can also be found in the following:

- National Wildlife Refuge System Administration Act of 1966;
- Refuge Recreation Act of 1962;
- Title 50 of the Code of Federal Regulations;
- Fish and Wildlife Service Manual; and
- National Wildlife Refuge System Improvement Act of 1997.

Lands within the National Wildlife Refuge System are closed to public uses until specifically and legally opened. All programs and uses must be evaluated based on mandates set forth in the National Wildlife Refuge System Improvement Act of 1997. Those mandates are to:

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- Contribute to ecosystem goals, as well as refuge purposes and goals;
  - Conserve, manage, and restore fish, wildlife, and plant resources and their habitats;
  - Monitor the trends of fish, wildlife, and plants;
  - Manage and ensure appropriate visitor uses as those uses benefit the conservation of fish and wildlife resources and contribute to the enjoyment of the public (these uses include fishing, hunting, wildlife observation, wildlife photography, and environmental education and interpretation); and
  - Ensure that visitor activities are compatible with refuge purposes.

## **RELATIONSHIP TO STATE WILDLIFE AGENCY**

A provision of the National Wildlife Refuge System Improvement Act of 1997, and subsequent policy, is that the Service shall ensure timely and effective cooperation and collaboration with other Federal agencies and State fish and wildlife agencies during the course of acquiring and managing refuges. State wildlife management areas, State wildlife refuges, and national wildlife refuges together provide the foundation for protection of species and biological diversity, and contribute to the overall health and conservation of fish and wildlife species in Tennessee.

The Tennessee Wildlife Resources Agency (TWRA) <http://www.state.tn.us/twra/> is the State agency charged with game enforcement responsibilities and management of State natural resources in Tennessee. The TWRA manages approximately 1.35 million acres of State wildlife management areas and State wildlife refuges, coordinates the State's wildlife conservation program, and provides public recreation opportunities, including an extensive hunting and fishing program on State wildlife management areas.

An important part of the comprehensive conservation planning process is integrating common mission objectives where appropriate. The State's participation and contribution throughout this comprehensive conservation planning process provide for ongoing opportunities and open dialogue to improve the management of fish and wildlife resources in Tennessee.

As previously mentioned, a joint, interagency planning process was performed simultaneously with the State of Tennessee, in collaboration with the Service's CCP planning in west Tennessee. This joint planning study area encompassed approximately ten thousand square miles of private, State, and Federal lands, including national wildlife refuges lands (Figure 1). It was determined that this cooperative planning effort would develop comprehensive plans for State, private, and Federal lands.

In order to perform planning cooperatively, the cooperating agencies had to consider differences in their mandates and requirements. Whereas the Service is required in all "significant" management actions to satisfy the mandates of the National Environmental Policy Act of 1969 (NEPA) (including opportunities for public comment and participation, and required documentation), State agencies are not required to satisfy NEPA. In essence, certain regulations which dictate Federal planning requirements do not apply to TWRA. So the various agencies sought to combine planning to the extent possible, while still providing the necessary autonomy within the process for each agency to accomplish its desired objectives.

A planning process outline was developed (Figure 2), which allowed both agencies to accomplish their planning objectives in a cooperative fashion. The process will produce joint objectives for west Tennessee lands and will allow the Service to plan according to NEPA requirements, while providing TWRA the freedom to accomplish its planning objectives without being encumbered by NEPA provisions.

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A Core Group was formed to oversee the planning process. This Group consists of TWRA and Service project leaders, planners, and biologists who serve to guide the overall effort. Under the leadership of the Core Group, nine Resource Working Groups were recruited and developed to study specific resource categories, including waterfowl, shorebirds, songbirds, big game, farm game, mammals, reptiles, amphibians, other aquatic resources, and public use. Each group was composed of individuals from various agencies, organizations, and universities, as well as private sector individuals with expertise in particular resources. The groups gathered information on species, critical habitats, and opportunities and developed management strategies for west Tennessee resource groups. These groups developed Focus Area-Wide Goals and Objectives, which were then translated into a series of map overlays, which rank areas of specific interest and provide a simple means for interrelating the various types of resource information included in each map. In addition, each Working Group developed a text describing goals, objectives, and strategies for implementing the desired goals and objectives for each specific resource category.

The map overlays and accompanying texts were interpreted into goals, objectives, and strategies for private, State, and Federal lands and were incorporated into the Draft West Tennessee Wildlife Resources Conservation Plan (WTWR Conservation Plan) (TWRA, USFWS 2002). These goals, objectives, and strategies for Federal lands were then used by the Service as the biological foundation for the CCP planning process. Based on these biological foundations for west Tennessee lands, the CCP process resulted in the production of a Draft CCP for each national wildlife refuge in west Tennessee, including Reelfoot, Lake Isom, Chickasaw, Lower Hatchie, and Hatchie.

Once finalized, the CCPs will be combined with the map overlays and texts of the WTWR Conservation Plan to form the master document for the entire west Tennessee planning effort, called the West Tennessee Master Plan. This final product is expected to be compiled in 2005 and will serve as a valuable resource for State and Federal managers alike, especially from a standpoint of cooperative, interagency management, and administration of west Tennessee resources.

## **ECOSYSTEM CONTEXT**

### *OVERVIEW*

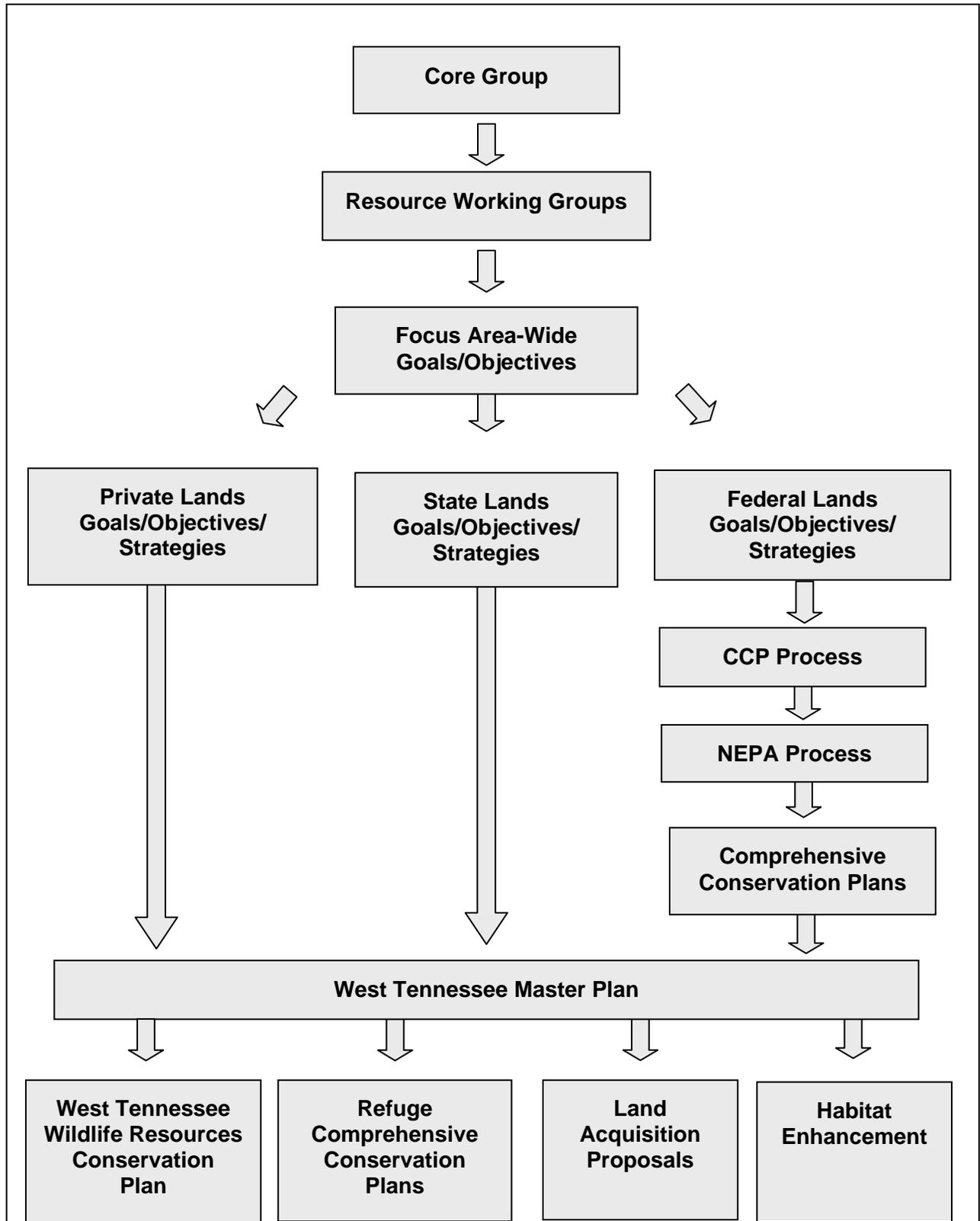
On a national level, the Service has adopted an ecosystem approach to resource management and has identified 52 ecosystems in the United States (USFWS 1994). Lower Hatchie National Wildlife Refuge is located within the Lower Mississippi River Ecosystem (Figure 3). Service resource priorities for the Lower Mississippi River Ecosystem are:

- Conserve, enhance, protect, and monitor migratory bird populations and their habitats in the Lower Mississippi River Ecosystem.
- Protect, restore, and manage the wetlands of the Lower Mississippi River Ecosystem.
- Protect and/or restore imperiled habitats and viable populations of all threatened, endangered, and candidate species and species of concern in the Lower Mississippi River Ecosystem.
- Protect, restore, and manage the fisheries and other aquatic resources historically associated with the wetlands and waters of the Lower Mississippi River Ecosystem.

Restore, manage, and protect national wildlife refuges and national fish hatcheries (USFWS Ecosystem Plan 2000).

The Lower Mississippi Valley once supported a vast bottomland hardwood forest complex that extended along the Mississippi River from Illinois to Louisiana. Today, less than 20 percent of this bottomland hardwood forest remains and most is fragmented or remains in scattered patches

Figure 2. West Tennessee planning process



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throughout the region (Figure 4). Flood waters once recharged wildlife habitats and created rich, dynamic systems that supported a diverse abundance of fish and wildlife species. Today, the Lower Mississippi Valley is fragmented by levees and its hydrology is restricted by flood control projects and agricultural diversion. Water quality is significantly impacted by agricultural and industrial runoff. Rivers and water bodies throughout are highly turbid and laden with pesticides; they support a small fraction of the once-abundant aquatic resources.

Recovery and protection of habitats and wildlife species require the joint efforts of private landowners, local communities, and State and Federal agencies. The Service continues to focus efforts on adopting collaborative resource partnerships in order to reduce the declining trend of fish and wildlife populations and biological diversity, establish conservation priorities, clarify goals, and solve common threats and problems associated with fish and wildlife resources. Biological objectives targeted in this plan reflect the common interests of numerous State and Federal agencies, local governments, non-governmental organizations, and private interests, and are supportive of numerous regionally, nationally, and internationally significant plans, as listed previously.

### *THREATS AND PROBLEMS*

The Lower Mississippi Valley is among the most heavily modified areas in the southeastern United States and has the dubious distinction of being one of the most deforested of all southeastern physiographic areas (Twedt et al., 1999). Clearing and fragmentation of forests have resulted in irreplaceable losses of wildlife habitats, species, and biological diversity. National wildlife refuges in the Lower Mississippi Valley serve as a critical safety net for preservation and management of the remaining wildlife resources.

Threats and problems affecting biological diversity in the Lower Mississippi Valley include:

- The loss of sustainable communities, including the loss of 20 million acres of bottomland hardwood forests;
- The loss of connectivity between bottomland hardwood forest sites, i.e., fragmentation;
- The effects of constructing navigation and water diversion projects, and the effects of agricultural and timber harvesting practices;
- The homogenization of the remaining wildlife habitats and gene pools within the ecosystem; and
- The cumulative habitat effects of land and water resource development activities.

As a result of these large-scale impacts, many species endemic to the Lower Mississippi Valley have become extinct, threatened, or endangered. The red wolf and Florida panther are no longer found in the Lower Mississippi Valley; the ivory-billed woodpecker and Bachman's warbler, once known to occur in the area, are considered critically endangered, if not extinct.

Habitat loss and fragmentation and hydrologic alteration in the Mississippi Alluvial Valley (MAV) have resulted in population declines in both overwintering waterfowl and migratory forest birds (Bonney et al., 2000). Populations of dabbling ducks have decreased in the past several decades, and evidence indicates the availability of foraging habitat (or lack thereof) has had the greatest influence on the abundance, distribution, and body condition of waterfowl in the MAV (Loesch et al., 1994).

Species most adversely affected by deforestation and fragmentation are species that are area sensitive or dependent on special habitat requirements, such as large, mature blocks of forest that offer secure

**Figure 3. Lower Mississippi River Ecosystem**

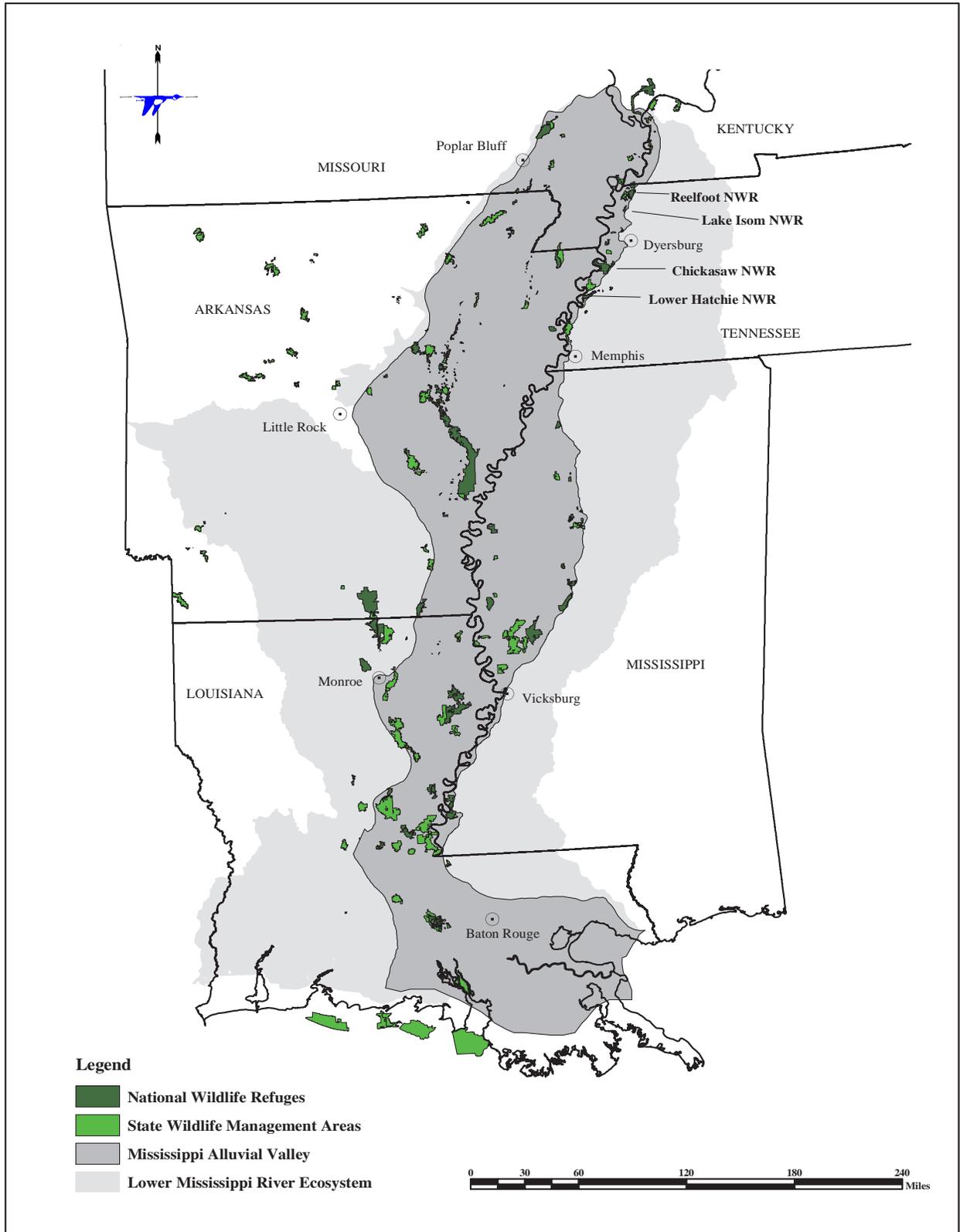
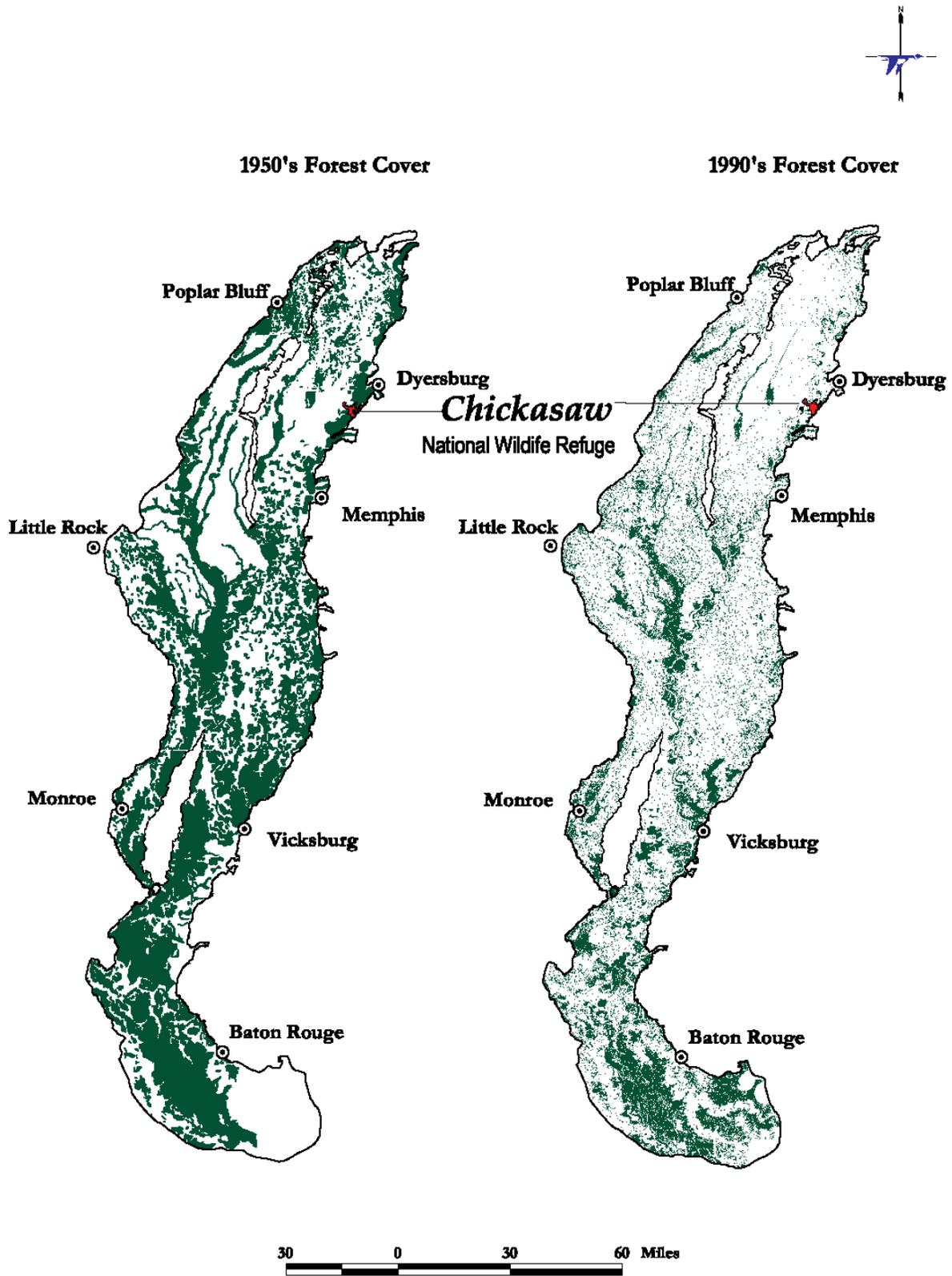


Figure 4. Forest Cover Changes in the Lower Mississippi River Valley



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nesting habitat and a particular food source. At least 107 bird species nest regularly in the Mississippi Alluvial Valley, excluding wading birds and colonial nesting waterbirds, with at least 70 species occurring in bottomland hardwoods as a primary habitat (Twedt et al., 1999). Less than 1 percent of the remaining forest patches are large enough to support source populations of area-sensitive species, such as cerulean warblers, Swainson's warblers, and swallow-tailed kites (Bonney et al., 2000).

Modifications to the historic flood plains have caused major declines in fisheries and aquatic resource productivity. Despite the efforts by the Service and others to conserve fish and other aquatic resources, a growing number is declining at alarming rates. On a national level, almost 400 aquatic species either have, or need, special protection in some part of their natural or historic range (Williams et al., 1989; Moyle and Leidy 1992). The number of aquatic species listed as threatened or endangered under the Endangered Species Act in 2002 has increased to 19 amphibian species, 21 crustacean species, 70 mussel species, and 115 fish species. The reasons for these declines are linked largely to habitat loss or alteration, including flow changes, watershed modifications, sedimentation, and pollution, and the impacts of harmful exotic or transplanted species (USFWS 2002).

### *CONSERVATION PRIORITIES AND INITIATIVES*

Conservation priorities for national wildlife refuges in the Lower Mississippi Valley focus on threatened and endangered species, trust species, and species of area concern. Working with others makes the Service more effective in achieving its overall mission and management goals. The Service and other agencies also consider bottomland hardwood forests a high priority on which to focus conservation and management efforts. A combination of land protection and habitat management methods is utilized by the Service and others to compensate for bottomland hardwood habitat loss and to meet shared/common long-term goals established for this area.

The goals of the North American Waterfowl Management Plan and the Joint Venture Plan have also been considered in the development of this plan. The Lower Mississippi Valley serves as the primary wintering habitat for mid-continent waterfowl populations. The goal of the North American Waterfowl Management Plan (North American Waterfowl Management Plan Committee 1998) is to develop partnerships between private and governmental organizations to address the maintenance and management of continental waterfowl populations, and to reverse the persistent loss of North American wetland habitats. In addition, the Lower Mississippi Valley Joint Venture plan encompasses a regional approach with the same objectives, to reduce or eliminate habitat losses for wetland-dependent migratory birds. The Joint Venture initiated cooperative efforts among public and private conservation groups to restore lands that provide maximum benefits to migratory waterfowl and songbirds and has identified conservation areas on which to focus future land protection and restoration efforts.

One of the Joint Venture's long-term goals is to provide "forest islands" for migratory bird conservation in the Lower Mississippi Valley, ranging in size from 10,000 to more than 100,000 acres. Habitat objectives in the MAV have been established by Partners-in-Flight in the Mississippi Valley Bird Conservation Plan (Twedt et al., 1998). In order to meet population objectives for migratory land birds, this Plan has identified 87 Bird Conservation Areas, broken down into blocks of 10,000 to 20,000 acres, 20,000 to 100,000 acres, and more than 100,000 acres of forested wetlands. These targeted land bases will serve as priority areas for forest restoration and will someday serve as important "anchors" for biological diversity.

In Tennessee, forested wetland objectives include the acquisition and/or protection of one each of the following blocks: 10,000 to 20,000 acres, 20,000 to 100,000 acres, and more than 100,000 acres. Three Tennessee MAV Bird Conservation Areas (BCAs) were identified by Ford (1998) and are delineated in Figure 5. The three Tennessee BCAs are further delineated as the Upper, Middle, and

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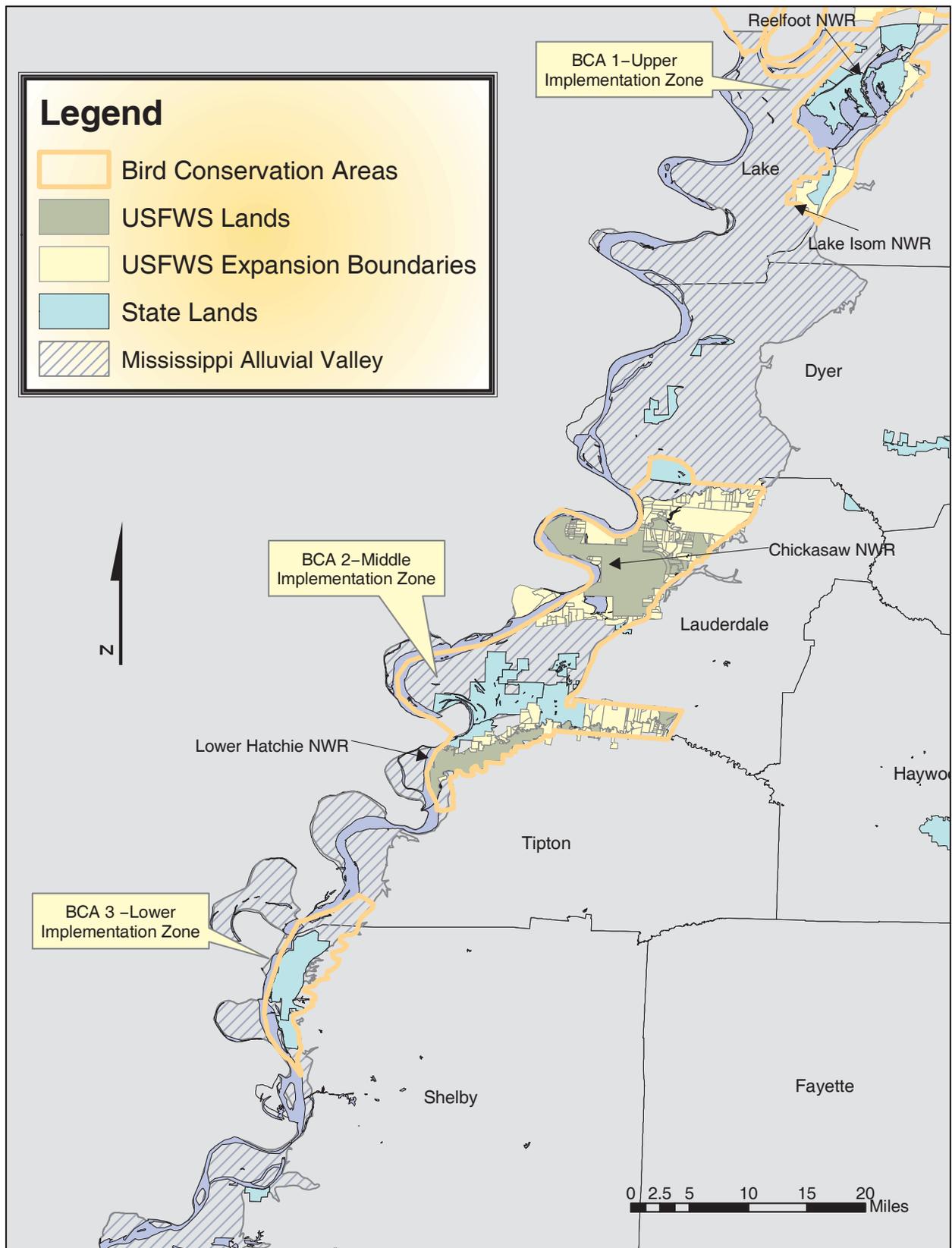
Lower Implementation Zones. Lower Hatchie Refuge is included within the Middle Implementation Zone, which totals approximately 165,472 acres (TWRA, USFWS 2002), and refuge land acquisitions would contribute toward achieving BCA goals.

Restoration of migratory songbird breeding and migration habitat is a high priority of the Partners-in-Flight Plan (Twedt et al., 1999), a national and regional planning effort developed to emphasize land bird species as a priority for conservation. Habitat loss, land bird population trends, and vulnerability of species and habitats to threats are all factors used in the priority ranking of migratory songbird species (Bonney 1999). Furthermore, biologists are identifying focal species for each habitat type from which population and habitat objectives and conservation actions can be determined. This list of focal species, objectives, and conservation actions will aid migratory bird management on the refuge.

The Lower Mississippi River Ecosystem Plan (USFWS Ecosystem Plan 2000) has established five resource ecosystem goals, which have also been considered in the development of this plan. These goals involve the protection, enhancement, and management of the following: migratory bird populations and habitats; wetlands; habitats and populations of threatened, endangered, and candidate species; fisheries and aquatic resources; and national wildlife refuges and national fish hatcheries.

Conservation management on private lands is extremely important to the future conservation of fish and wildlife resources. To achieve conservation priorities on private lands and in conjunction with public lands, the synergy of Federal, State, tribal, and private organizations, working together, will ensure that the Service not only protects the more important areas, but also helps to reduce redundancy and overlap in the management efforts of various agencies and private organizations.

Figure 5. West Tennessee MAV bird conservation areas





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## *II. The Planning Process*

### **OVERVIEW**

The west Tennessee planning effort includes the preparation of four CCPs, comprising five national wildlife refuges (Lower Hatchie, Chickasaw, Reelfoot/Lake Isom, and Hatchie), as well as the cooperative, interagency WTWR Conservation Plan, which identifies resources and management goals for approximately 10,000 square miles of Federal, State, and private lands in west Tennessee, with an emphasis on migratory birds. In addition to serving as a guide for resource management efforts in the western third of the State, the WTWR Conservation Plan provides the main biological foundation for the four west Tennessee CCPs.

In the Mississippi Alluvial Valley, in which four of the five refuges are located, migratory bird habitat requirements and desired acreages were developed prior to the CCP planning process (Ford and Wathen 2001; TWRA and USFWS 2002; Twedt et al., 1999). Given these prior MAV recommendations, it was clear going into the CCP planning effort that ample habitat to meet these habitat objectives could not be provided on national wildlife refuges alone. Therefore, in order to achieve the habitat goals that had already been established, the west Tennessee planning effort looked beyond the respective refuge boundaries and incorporated into the planning effort any public and private lands that might be available. This cooperative planning effort between the Service and TWRA produced a broad overview of present and future resource management needs for west Tennessee and incorporated over 6 million acres of land.

The final product of west Tennessee planning will be a West Tennessee Master Plan, which will incorporate the basic recommendations of the WTWR Conservation Plan within the context of the four CCPs. The primary objective of the Master Plan is to provide a means of cooperatively protecting, restoring, and managing a sufficient amount and diversity of habitat to meet the requirements of migratory birds and resident wildlife that use Federal, State, and private land habitats in the western third of the State of Tennessee.

The planning process began in January 2000, with initial Core Group meetings in which the Service and TWRA began efforts to produce the WTWR Conservation Plan. The Core Group selected nine resource working groups, which then began the process of developing goals, objectives, and strategies for specific resource categories on Federal, State, and private lands within the planning area (Figure 1).

Preplanning for the Lower Hatchie CCP also began during early 2000. Issue identification is a major factor in determining management goals and objectives for CCPs. To ensure that future refuge management is responsive to all relevant issues and concerns, a series of meetings and interviews was conducted to guide issue selection for the planning effort. In September 2000, the Lower Hatchie CCP Technical Team (comprised of staff from Lower Hatchie Refuge and the West Tennessee Refuge Complex) began meeting to discuss issues and management opportunities, and on October 26, 2000, a public scoping meeting was held in Covington, Tennessee. At the meeting, the public was given the opportunity to comment orally or in writing regarding perceived issues and opportunities for management of the refuge. The scoping meeting was advertised locally and by mailings, and additional comments were received by mail, phone, and email. The West Tennessee Refuge Complex planning staff then developed a comprehensive list of issues to be considered in the development of management alternatives in the Environmental Assessment (Section B of this document).

Coordination with Federal, State, and local agencies, as well as non-governmental organizations and surrounding communities, is also essential to ensure support for the plan and projects identified for

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the refuge. In April 2001, an initial meeting was held with the Lower Hatchie Planning Review Group, in which refuge neighbors, organizations, educators, government agencies, and local officials were invited to attend and share their thoughts in a focus group meeting. The Lower Hatchie Planning Review Group includes representatives from TWRA, The Nature Conservancy, Tennessee Department of Environment and Conservation (TDEC), Anderson-Tully Company, Friends of West Tennessee National Wildlife Refuges, Ducks Unlimited, Tennessee State Parks, U.S. Geological Survey, as well as local sportsmen, farmers, landowners, businessmen, and county officials. This group provides oversight during the planning process with input from local individuals and private interests. Draft versions of CCP documents are routed to Planning Review Group members periodically for review, and comments received are considered in plan revisions.

The nine resource working groups began meeting in early 2000, and in January 2002, the Draft WTWR Conservation Plan was completed and became available as the primary biological foundation for much of the Lower Hatchie Refuge CCP planning process. Based on this biological foundation, other relevant documents, input received from the public, as well as the staff's professional judgment, the Lower Hatchie Technical Team evaluated relevant issues and resource needs and developed various management alternatives, which were then considered in the draft environmental assessment (EA). The range of alternatives developed in the EA addresses four different management scenarios, in which each relevant issue and concern is considered in the context of at least one of the alternatives. The EA constitutes the documentation and the process by which the proposed action is selected.

Once the proposed action was selected, the Lower Hatchie Technical Team developed goals, objectives, and strategies for accomplishing the preferred management scenario over the next 15 years. These management objectives and strategies are developed within the context of this Draft CCP (Chapter IV).

A second public meeting will be held to allow public review and comment on this Draft CCP, and a third public meeting will be held to present the Final CCP document.

## **ISSUES**

Issue identification provides the basis for initiating the development of management objectives and strategies. These issues play a role in determining future conditions of the refuge and will be considered in the long-term management plan. The issues and concerns described in the following pages were generated by the public, the Planning Review Group, and Service staff. An initial list of approximately 62 issues was consolidated into the following list of 21 issue categories concerning Lower Hatchie Refuge. The list was grouped according to the following five broad management categories: fish and wildlife population issues, habitat issues, visitor services and environmental education issues, refuge administration and operation issues, and land protection and conservation issues. See Appendix VII for a summary of the actual comments received during the public scoping process.

### *FISH AND WILDLIFE POPULATION ISSUES*

#### **Waterfowl Populations**

Since the refuge's establishing purpose was specifically for it to be an "inviolable sanctuary for migratory birds" (see Chapter III), all operation and management activities are considered in light of their impact on migratory birds, the most numerous of which are waterfowl. The refuge staff monitors waterfowl populations that utilize the refuge and works to provide sufficient, high quality habitat to fulfill population objectives set for the Mississippi Alluvial Valley, as established in Ford and Wathen (2001) and the WTWR Conservation Plan (TWRA and USFWS 2002). A portion of the refuge is dedicated to providing seasonally flooded cropland, moist-soil impoundments, and forested wetlands

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to meet the feeding, resting, and breeding needs of migratory and resident waterfowl (see Habitat Issues). In order to meet its objectives for waterfowl, the refuge must maintain enough cropland/moist-soil areas to meet waterfowl habitat needs and provide sufficient sanctuary areas for undisturbed resting and feeding.

### **Songbird Populations**

Nearly every study examining North American neotropical migratory bird population trends has reported declines in at least some species (Askins et al., 1990). The Mississippi Alluvial Valley has been identified as a physiographic area experiencing some of the most widespread and pronounced declines (Hamel et al., 1994). Partners-in-Flight Conservation Plans have been developed for the Mississippi Alluvial Valley (Twedt et al., 1998) and the East Gulf Coastal Plain (Woodrey et al., 1998) to address priority species and bird conservation issues. The refuge continues to work to monitor migratory and resident songbirds and to address habitat issues, which affect resident and neotropical migratory bird populations, in keeping with refuge goals and establishing purposes.

### **Threatened and Endangered Species**

A key function of Lower Hatchie Refuge is to enhance the survival of threatened and endangered species. Three federally listed threatened or endangered animals are known to use or populate lands within or in close proximity to the refuge: the bald eagle, the pallid sturgeon, and the interior least tern. As many as 10 bald eagles are known to winter annually on the refuge, although no active nests are documented on refuge lands. The refuge's habitat restoration and protection activities continue to provide suitable habitat for nesting eagles. Pallid sturgeon are not known to inhabit refuge waters but are known to inhabit the Mississippi River, which is immediately adjacent to the refuge. The refuge can support pallid sturgeon recovery efforts by providing technical assistance to other Service divisions or resource management agencies and by supporting efforts to restore riverine habitat. Interior least terns nest on Mississippi River sandbars, which are in close proximity to the refuge, and are regularly observed feeding on refuge lands. The refuge's protection of lands immediately adjacent to the Mississippi River includes sand bars where least tern nesting colonies exist during summer months.

### **Resident Species Populations**

Resident species include game species, such as white-tailed deer, wild turkey, squirrels, rabbits, and furbearers, as well as nongame groups, including nongame mammals, reptiles, and amphibians. The refuge monitors some resident wildlife populations through surveys, such as the turkey survey and amphibian monitoring. Species groups that lend themselves to management (e.g., deer and turkey) are managed at levels consistent with habitat availability, refuge management goals, and refuge purposes. Other species are observed and monitored in order to identify potential management issues. Benefits to resident species are a consideration when opportunities for refuge land acquisitions exist.

### **Shorebird Populations**

Due to the abundance of agricultural land with water control capabilities, and the frequent inundation of these fields by floodwaters, the Mississippi Alluvial Valley has significant potential for providing shorebird habitat (Elliott and McKnight 2000). Management activities for waterfowl also provide shorebird habitat, especially in conjunction with management of impoundments and moist-soil units. The staff monitors refuge shorebird use and looks for opportunities to support priorities outlined in the WTWR Conservation Plan (TWRA and USFWS 2002) for migratory and resident shorebird populations, in keeping with refuge goals and establishing purposes.

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## HABITAT ISSUES

### **Waterfowl Habitat**

Providing habitat for migratory birds, the most numerous of which are waterfowl, was the purpose for which the refuge was established. Thus, management priorities must be directed toward providing quality wetland areas that are attractive to migratory birds, including dabbling ducks, diving ducks, and geese. Each management unit provides a unique set of resources that is necessary for each group to complete its life cycle. A portion of the refuge is dedicated to providing seasonally flooded cropland, moist-soil impoundments, and forested wetlands to meet the feeding, resting, and breeding needs of migratory and resident waterfowl. In order to meet its objectives for waterfowl, the refuge must maintain enough cropland/moist-soils areas to meet waterfowl habitat needs and provide sufficient sanctuary areas for undisturbed resting and feeding.

### **Songbird Habitat**

As stated in the previous section concerning waterfowl habitat, priorities on the refuge include providing quality habitat for migratory birds, including neotropical migratory songbirds. Land management practices, especially forest management practices, will continue to take into account the value of such practices to songbird habitat. The refuge will continue to work to monitor migratory and resident songbirds and to address habitat issues, which affect resident and neotropical migratory bird populations, in keeping with refuge goals and establishing purposes.

### **Forest Habitat Management**

The refuge protects over 7,000 acres (including Sunk Lake Public Use Natural Area) of bottomland hardwood habitat and over 1,000 acres of upland forests. The forests found on the refuge provide invaluable habitat for the wide range of wildlife species that inhabit the refuge; they are critical to the preservation of this drastically diminished habitat type. Bottomland hardwood forests are critical to migratory and wintering waterfowl, particularly mallards and wood ducks. The forested tracts on the refuge provide crucial food resources, such as hard mast, soft mast, and invertebrates for mallards during flood events that occur during the fall and early spring periods. There are an additional 1,300 acres that have been reforested and that will provide valuable forested habitat in the future. The refuge will complete the habitat (including forest habitat) management plans, and management decisions will be made for vegetation management and control based on resource goals and refuge purposes, with due consideration for all other environmental factors.

### **Cooperative Farming**

Agricultural crops play an important role in the scheme of migratory bird management, as they provide a source of high-energy carbohydrates needed during periods of cold weather. Typically, the refuge supplies corn and soybean crops, which are rotated with moist-soil units or are produced on the higher elevations, to ensure that wildlife have a readily available food source and to meet refuge objectives set forth in the WTWR Conservation Plan. Lower Hatchie Refuge's cropland operation includes approximately 865 acres. The acreage, which varies from year-to-year based on management needs, is managed in a combination of agricultural crops and moist-soil foods. Under the cooperative farming agreement, acreage is divided by a 75 percent farmer to 25 percent refuge ratio. The refuge portion of the crops, usually grown on the lower and wetter fields, is left standing in the fields during harvest and provides supplemental forage for resident and migratory wildlife, specifically migratory waterfowl.

Another farming option being used on the refuge is force account farming, in which refuge personnel and equipment are used to plant agricultural crops. This practice is a key component in the overall management program, as it ensures that agricultural crops will exist on at least a portion of the refuge. Force account farming is more expensive than cooperative farming, in that the Service must

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bear all of the production costs, including personnel, equipment, seed, fertilizer, and chemicals. Alternatively, cooperative farming programs require the farmer to bear the cost of production and leave a designated share in the field as his payment for renting the property. Thus, force account farming has the disadvantage of greater expense, but the advantage of greater flexibility and retaining 100 percent of the production. Cooperative farming has little or no expense to the Service, but offers less flexibility and a substantial reduction in the total amount of agricultural products left in the field for utilization by wildlife.

Most crop fields, which are planted for the refuge, can be flooded for waterfowl utilization. This, coupled with subsequent acquisitions, sets the stage for the refuge to make substantial contributions to the Mississippi Flyway migratory bird objectives. The refuge's farming program will continue to work to address habitat issues, which affect migratory bird populations, in keeping with refuge goals and establishing purposes.

### **Moist-Soil Habitat**

Moist-soil habitats are an integral part of managing public wetlands for waterfowl as these food resources are provided in large part only on State and Federal lands. Lower Hatchie Refuge and the associated river floodplain are capable of supplying food resources such as barnyard grass, sprangletop, smartweeds, rice cut-grass, and a host of other beneficial herbaceous plant species. The refuge provides 185 acres of these early successional habitats and plays a key role in the migration patterns of mid-continent waterfowl and other migratory birds. The refuge's present and future will, in large part, be influenced by resource management, which actively benefits waterfowl, including moist soil-habitat. The management of the refuge's moist-soil units will continue to address habitat issues, which affect migratory bird populations, in keeping with refuge goals and establishing purposes.

## *VISITOR SERVICES AND ENVIRONMENTAL EDUCATION ISSUES*

### **Hunting and Fishing Access and Opportunities**

The National Wildlife Refuge System Improvement Act of 1997 stated two consumptive priority public uses for national wildlife refuges: hunting and fishing. In addition, hunting and fishing are integral parts of west Tennessee culture. Due to this fact, and the limited amount of public lands, it is not surprising that there is considerable interest in expanding refuge hunting and fishing opportunities. Any additional hunting opportunities will be dependent on providing safe, quality experiences that are compatible with refuge purposes. Refuge hunting opportunities could be expanded as the land base is increased through the refuge's continued land acquisition program from willing sellers. The refuge will examine opportunities to increase and/or enhance hunting and fishing opportunities, in keeping with other resource needs and the refuge's establishing purposes.

### **Nonconsumptive Recreational Opportunities**

The National Wildlife Refuge System Improvement Act of 1997 stated four nonconsumptive priority public uses for national wildlife refuges: wildlife photography, wildlife observation, and environmental education and interpretation. In keeping with this legislation, opportunities for these priority public uses would be provided and opportunities for increasing them would be examined. Currently, the majority of public use consists of hunting and fishing. The refuge currently does not have staff or facilities to provide significant on-refuge environmental education, interpretive, or wildlife-dependent recreational programming. More exposure resulting from expanded nonconsumptive recreational uses and programs would increase public awareness and have a positive effect on other refuge programs. The refuge is located in Lauderdale and Tipton Counties (combined population approximately 78,372, ) (U.S. Census Bureau 2000), within 20 miles of Covington, Tennessee (population approximately 8,162) and approximately 50 miles from Memphis, Tennessee (population approximately 873,000). Better-developed visitor facilities in association with a Lower Hatchie

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Refuge visitor center annex would provide wildlife-dependent environmental education, interpretation, and recreational opportunities currently not available in either Lauderdale or Tipton County. The refuge will examine opportunities to increase and enhance nonconsumptive recreational opportunities on the refuge, in keeping with other resource needs and the refuge's establishing purposes.

### **Access**

Lower Hatchie Refuge is a frequently visited refuge with an abundance of public interest in opportunities to enjoy natural resources. With the National Wildlife Refuge System Improvement Act of 1997, refuges have been mandated to provide, when compatible with refuge purposes, opportunities for wildlife-dependent forms of recreation. These activities are hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. Therefore, attention must be given to providing the appropriate amount and forms of access for the public. Consideration should be given to access issues through increasing or limiting access opportunities, based on total resource management goals and refuge purposes.

## *REFUGE ADMINISTRATION AND OPERATION ISSUES*

### **Maintenance and Operations**

Funding for refuges must be prioritized and divided among the over 545 individual refuges, which comprise the National Wildlife Refuge System. Operating within a fixed budget necessitates prioritizing programs and projects that compete for funding and staffing. Through the Refuge Operations Needs System (RONS) and the Maintenance Management System (MMS) processes, budgetary requests are forwarded and funding is assigned to maintenance needs, considering priority resource needs and budget constraints. Management priorities include managing aquatic and forest habitat, fish and wildlife populations, endangered species, cultural resources, public use, and law enforcement, as well as facilities maintenance. Consideration should be given to providing comprehensive maintenance to refuge facilities within the constraints of available funding and management priorities, based on total resource management goals and refuge establishing purposes. Management decisions would continue to consider priority operational needs, and budgetary requests would be made in keeping with refuge goals and purposes.

### **Enforcement**

Large tracts of public lands may provide unique opportunities for public use. Unfortunately, in some cases there is misuse, and so the continual involvement of law enforcement personnel is necessary in order to protect the resources, as well as the public. However, staff limitations preclude intensive enforcement on refuge lands. As with other Lower Hatchie Refuge issues, priorities must be established, which compete for available funding and staffing. Enforcement issues should be considered and ways to improve law enforcement capabilities examined, in keeping with the goals and purposes for which the refuge was established.

### **Information**

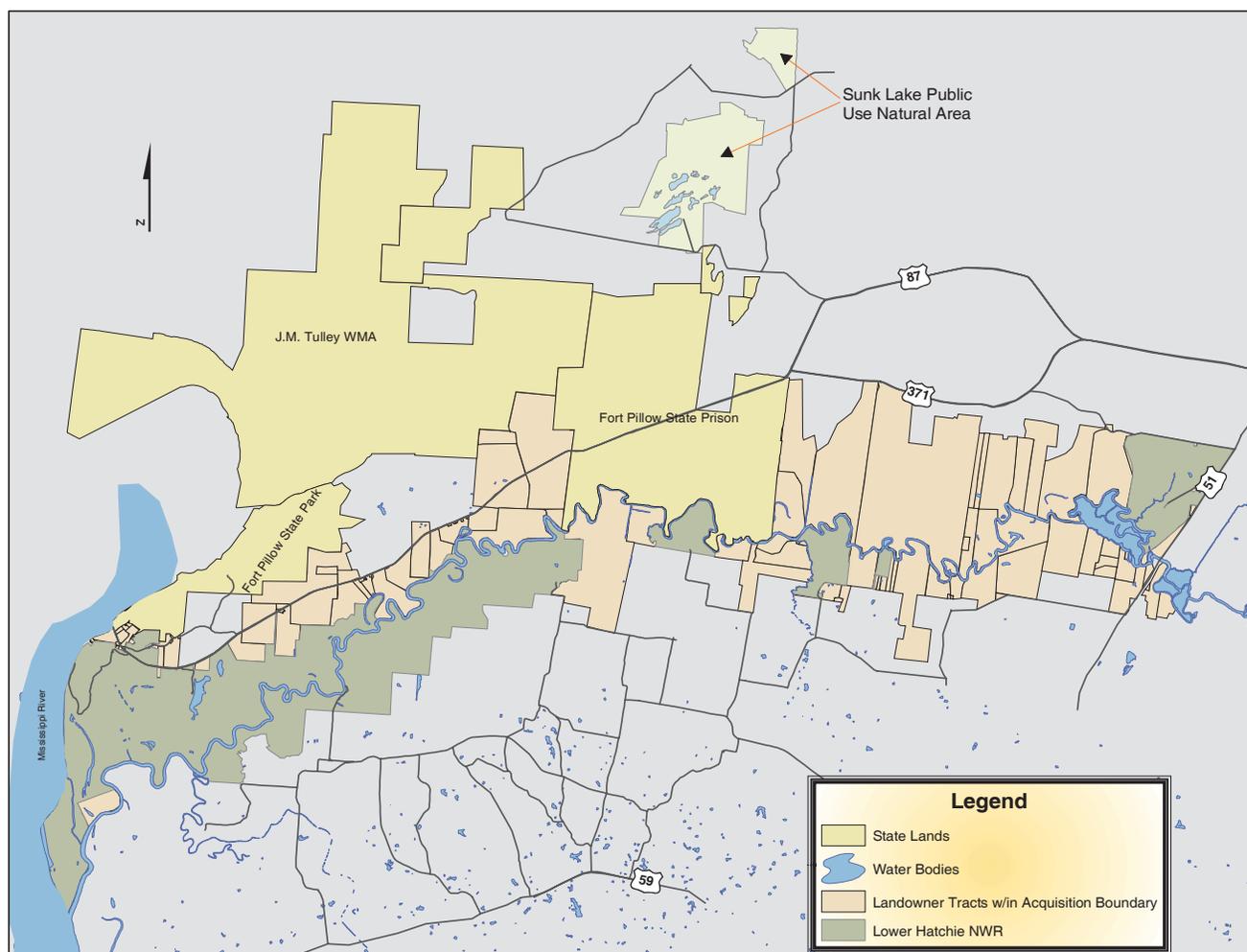
Good quality, available sources of information are critical to the public's appreciation and use of refuge resources. Information dissemination provides a vehicle for refuge managers to communicate to the public the many recreational opportunities found on the refuge, as well as the value of the resources. Refuge management would consider ways to better provide needed information to the public and to improve existing information resources, in keeping with resource management goals and the refuge's establishing purposes.

## LAND PROTECTION AND CONSERVATION ISSUES

### Land Acquisition

Refuge land acquisitions provide additional protection for land and resources, as well as additional wildlife-dependent recreational opportunities for the public. Lower Hatchie Refuge has an approved acquisition boundary of 23,229 acres. As of June 1, 2004, the Service had acquired a total of 9,451 acres from within this boundary (Figure 6).

**Figure 6. Approved acquisition boundary of the Lower Hatchie National Wildlife Refuge**



Public perception of Federal land acquisitions is often clouded by historical instances in which eminent domain was exercised and private lands were “taken” from unwilling landowners. However, it is the Service’s policy to acquire land from willing sellers and every effort should be made to provide effective information to the public in order to promote understanding of the refuge acquisition process. Management decisions must include acquisition priorities, as well as future management of acquired tracts in light of refuge goals and objectives and refuge establishing purposes.

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### **Water Level Management**

Water level management has the potential to affect resources on the refuge and its immediate vicinity. Numerous hydrological issues exist in regard to agricultural drainage, beaver flooding, and natural flooding induced by the Hatchie and Mississippi River systems. Impacts from refuge water management can include flooding, altered drainage patterns, and sedimentation. The CCP process would attempt to address the individual water level issues on a case-by-case basis, while keeping management decisions in line with management goals and refuge purposes, as well as potential water level impacts on neighboring lands.

### **Protection of Unique Areas**

In addition to the 9,451 acres of the refuge owned in fee title by the Service, the 1,873-acre Sunk Lake Public Use Natural Area (Sunk Lake) is owned by the State of Tennessee but managed by the Service under a 10-year lease agreement as a component of the refuge. Sunk Lake has been designated by the Tennessee Department of Environment and Conservation (TDEC) as a Class II Natural Area. This classification exists for the “protection of natural-scientific areas, which are associated with and contain floral assemblages, forest types, fossil assemblages, geological phenomena, hydrological phenomena, swamplands, and other similar features or phenomena, which are unique in natural or scientific value and are worthy of perpetual preservation” (TDEC and USFWS 2004). The Sunk Lake Public Use Natural Area contains an outstanding example of the baldcypress swamp and mixed bottomland hardwood complex that was once prevalent in west Tennessee, and is managed according to specific guidelines provided by the State of Tennessee, which ensures the protection and preservation of this unique area. The Sunk Lake Management Plan is included in Appendix VIII.

While only one archaeological survey has been conducted on the refuge, past history indicates the likelihood of many more cultural sites to exist on refuge lands. Refuge management should include efforts to identify and protect these unique areas, in keeping with refuge goals, objectives, and establishing purposes.

### **Protection of Refuge Lands**

The remote location of much of the refuge, as well as the numerous tracts that have recently been acquired, presents ongoing challenges to maintain clear identification of refuge boundaries. Activities which threaten refuge boundaries or lands must be addressed through enforcement and land protection measures. Management decisions must include a thorough analysis of existing or potential threats to land resources. Land protection and boundary line maintenance would be performed with consideration for budgetary constraints, and in keeping with refuge goals, objectives, and establishing purposes.

Each of these issues is also included in the “Summary of Management Alternatives” section of the Draft Environmental Assessment (Section B), in which all relevant issues are addressed in the context of the four different management alternatives considered during the planning process.

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### *III. Refuge Description*

#### **ACQUISITION**

Lower Hatchie National Wildlife Refuge is located in rural western Tennessee approximately 18 miles west of Henning, in Lauderdale and Tipton Counties (Figure 7). On June 19, 1980, the refuge was approved for the acquisition of 6,400 acres of bottomland hardwood forests and adjacent habitats for the management of wintering waterfowl and other migratory birds. In 1985, a 2,224-acre acquisition boundary was also approved.

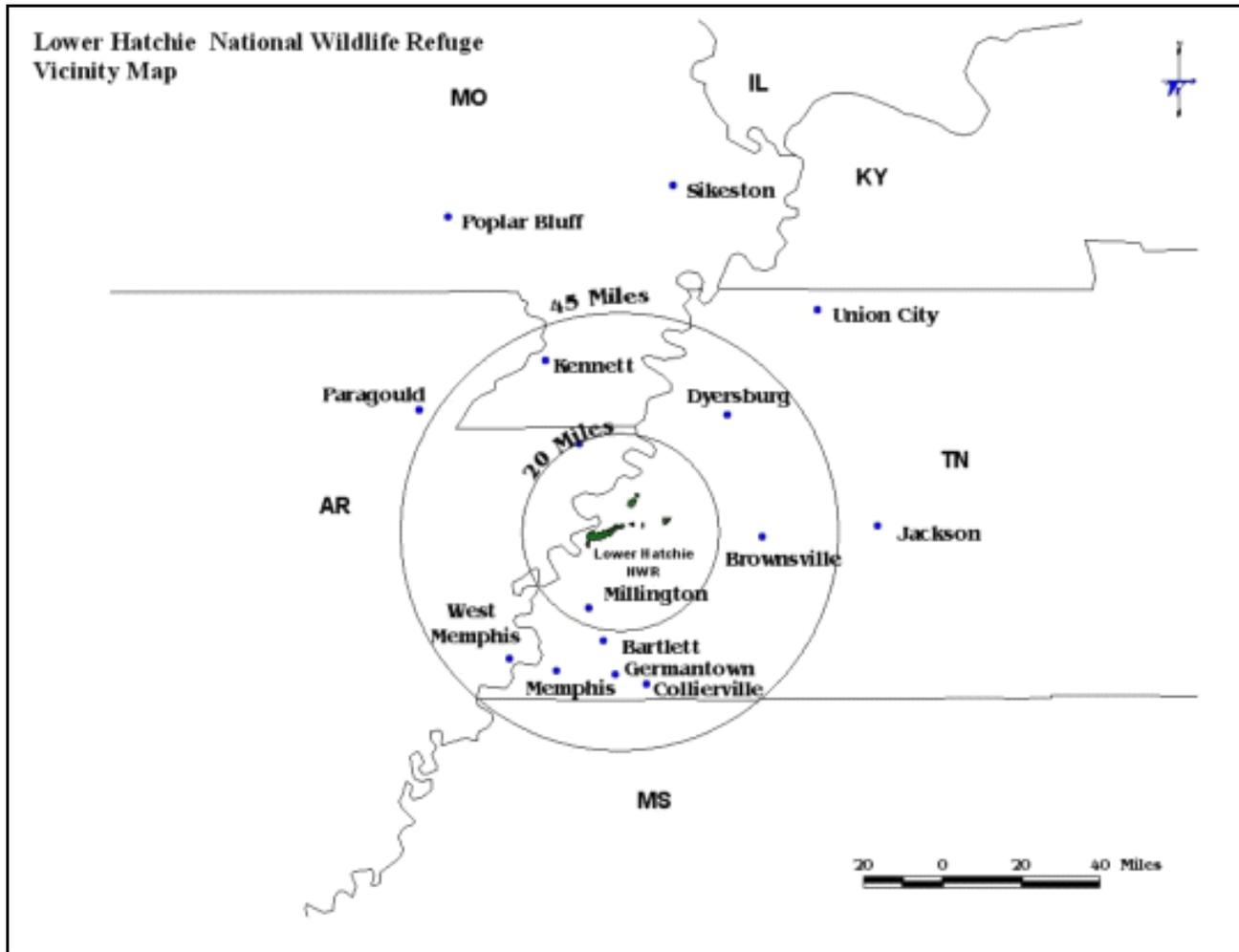
Another approved acquisition boundary was established in 1999, in some places coinciding with the previous 1985 boundary, but encompassing approximately 15,329 additional acres in Lauderdale and Tipton Counties adjacent to the existing refuge boundary (USFWS Land Protection Plan 2000). The Service proposes to acquire these lands through conservation easements, cooperative agreements, or fee title purchases from willing sellers, involving the acquisition of about 96 ownerships that vary in size from less than 1 acre to 2,100 acres in size. The proposed acquisitions, when complete, would increase the total Lower Hatchie Refuge acreage to 23,229 acres. Since the acquisition boundary was approved in 1999, six tracts have been acquired, totaling 1,389 acres, bringing the refuge to a current total of 9,451 acres (July 1, 2004).

The U.S. Fish and Wildlife Service acquires lands and waters in a manner consistent with legislation, other congressional guidelines, and executive orders for the conservation, management, and, where appropriate, restoration of ecosystems, fish, wildlife, plants, and related habitat, and to provide for compatible, wildlife-oriented public use for educational and recreational purposes. These lands include national wildlife refuges, national fish hatcheries, waterfowl production areas, and other areas. The Service acquires land and water interests including, but not limited to, fee title, easements, leases, and other interests. Donations of desired lands or interests are encouraged. Funding for acquisitions comes from receipts, such as Federal Duck Stamp sales, entrance fees to certain national wildlife refuges, import taxes on arms and ammunition, and appropriations under the Land and Water Conservation Fund Act (USFWS 2001).

It is anticipated that funding for future land acquisitions would be provided through the Migratory Bird Conservation Fund and the Land and Water Conservation Fund. The authorities for the use of these funds for land acquisition are the Migratory Bird Conservation Act (16 U.S.C. Sec. 715d) and the Refuge Recreation Act (16 U.S.C. Sec. 460k-1).

In addition to the actual refuge acreage, the 1,873-acre Sunk Lake Public Use Natural Area is also managed as a component of the refuge. Sunk Lake and surrounding bottomland hardwood forests were purchased by the State of Tennessee through the Natural and Cultural Areas Acquisition Fund in 1986. This unique area was designated as a Class II Natural Area by the State and management was transferred to the Service by a renewable 10-year lease agreement in 1988. Sunk Lake is managed according to a management plan developed by TDEC, which focuses on protection and preservation of the area's unique natural properties, with limited recreational opportunities.

Figure 7. Vicinity Map



## REFUGE PURPOSE

Lower Hatchie National Wildlife Refuge was authorized by the Migratory Bird Conservation Act of 1929 (16 U.S.C. 715d) for "... use as an inviolate sanctuary, or for any other management purpose, for migratory birds." The Fish and Wildlife Act of 1956 established additional refuge purposes to be "... for the development, advancement, management, conservation, and protection of fish and wildlife resources (16 U.S.C. 742f (a)(4)) and "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition or servitude ..." (16 U.S.C. 742 (b)(1)). Later, the Refuge Recreation Act of 1962 (16 U.S.C. 460(k)(1)) declared the refuge to be "suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, and (3) the conservation of endangered species or threatened species ...."

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The Land Acquisition Planning Report (USFWS1985), which proposed the initial land acquisitions for Lower Hatchie Refuge, stated the purpose of the acquisition proposal: “(1) to preserve and protect approximately 8,624 acres of important habitat needed for migrating and wintering waterfowl; (2) to serve as an important stepping stone for Canada geese, and thereby enhance the continued success of reestablishing wintering flocks of geese in the lower reaches of the flyway; and (3) to provide important sanctuary for wintering mallard ducks in extreme western Tennessee. Coincidental benefits of the refuge are the public recreational and educational uses that it provides.”

Expanding on these purposes, the Final Environmental Assessment and Land Protection Plan (USFWS 2000) prepared by the Service defined refuge objectives.

The management objectives identified for the proposed expansion at Lower Hatchie Refuge included:

- Preserve and protect a diverse, threatened wetland ecosystem and its associated fish and wildlife values;
- Preserve, protect, reestablish, and manage habitat for threatened and endangered species;
- Manage the refuge for migratory birds, with emphasis on providing optimum habitat for wintering waterfowl and enhancing nesting and brood habitat for wood ducks;
- Manage the refuge for native wildlife species and their associated habitats;
- Provide opportunities for environmental education, interpretation, and wildlife-dependent recreation.

The proposed project would also help support the priorities established by the Service’s Lower Mississippi River Valley Ecosystem Team. As listed previously in this CCP, (Chapter I, Background, Ecosystem Context), these priorities involve: migratory bird populations and habitats, wetlands, threatened and endangered species and their habitats, fisheries and aquatic resources, and national wildlife refuges and national fish hatcheries (USFWS, Ecosystem Plan 2000).

Sunk Lake Public Use Natural Area, managed as a component of the refuge, was acquired by the State of Tennessee and designated as a public use natural area prior to the lease agreement, which transferred management responsibilities to the Service. The purpose for Class II Natural Area lands is for the “protection of natural-scientific areas, which are associated with and contain floral assemblages, forest types, fossil assemblages, geological phenomena, hydrological phenomena, swamplands, and other similar features or phenomena, which are unique in natural or scientific value and are worthy of perpetual preservation” (TDEC and USFWS 2004).

## **REFUGE ENVIRONMENT**

### *TOPOGRAPHY AND CLIMATE*

Lower Hatchie Refuge is located at the confluence of the Hatchie and Mississippi Rivers in Lauderdale and Tipton Counties in west Tennessee. The refuge encompasses the lower reaches of the Hatchie River and consists of bottomland hardwoods, moist-soil units, agricultural fields, and associated uplands. The large forested tracts, open lands, and aquatic features found on the refuge provide an important ecological niche for fish, wildlife, and plant species. The topography of bottomlands is characteristically flat, but slight variations in elevation are associated with considerable differences in soils, drainage conditions, and forest species composition (Barrett 1980).

The dominant land forms of the Lower Mississippi River Ecosystem (LMRE) are the alluvial plain of the Mississippi River, downstream of its confluence with the Ohio River, and the deltaic plain and

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associated marshes and swamps created by the meanderings of the Mississippi River and its tributaries. While the ecological character of the LMRE is dominated by these land forms, valuable upland habitats from the East Gulf Coastal Plain are contained in the drainage basin of the Hatchie and Mississippi Rivers.

The Hatchie River basin lies within the west Tennessee plains, which slope gently westward from an elevation of 400 feet above mean sea level (msl) to 200 feet above msl. The basin drains about 1,664,600 acres of land and is roughly 220 miles long and 24 miles wide. The headwaters of the Hatchie River are in the State of Mississippi; the river flows into the Mississippi River approximately 35 miles north of Memphis, Tennessee. The river's drainage pattern is comprised of a main stream fed by many smaller streams. The floodplain of the main stream is wide and flat; it narrows to a ridge- and valley-type of landscape in the fan-patterned area upstream. The refuge has elevations ranging from approximately 230 to 240 feet above msl along the Hatchie River, with higher elevations adjacent to the Mississippi River, including elevations up to 378 feet adjacent to the Mississippi River bluff on the extreme western edge of the refuge. One unusually high feature on refuge lands south of the Hatchie River is called "Millstone Mountain," where elevations reach 400 feet msl. The Sunk Lake Public Use Natural Area ranges in elevation from 239 to 250 feet above msl.

The soils of the refuge are of the Falaya-Waverly-Collins Association. These are soils of the alluvial plain. They are susceptible to flooding, which continually occurs primarily in winter and spring. The soils are silty and fertile. Generally, these soils have poor drainage but are not too wet for corn and soybeans if artificial drainage is provided. These soil types are highly productive for many species of trees and highly responsive to management. Scour erosion occurs during out-of-bank flow but is probably offset by deposition of sediments. Eighteen soil series are found on Lower Hatchie Refuge. Four major types, Amagon, Commerce, Memphis, and Sharkey, represent approximately 80 percent of the refuge. The other types occur on a more localized basis. The Soil Survey of Lauderdale County, Tennessee (Monteith 1990), and the Soil Survey of Tipton County, Tennessee (McCowan et al., 1993), contain additional maps and descriptions of these soil types.

Lauderdale and Tipton Counties are non-leveed areas along the Mississippi River. Headwater flooding from the Mississippi River upstream of Lower Hatchie Refuge has been virtually eliminated by levees adjacent to the river. As a result, the frequency and duration of backwater flooding have increased in all non-leveed areas, including Lower Hatchie Refuge and adjacent lands. Natural patterns of erosion and sedimentation have been altered due to channelization and other human disturbances. Erosion rates have increased on both upland and alluvial soils. Sedimentation has increased in swamps, brakes, oxbow lakes, and other low-lying areas. Sediment loading in streams and rivers has increased, disrupting natural patterns of aggradation and degradation.

Altered hydrology and sedimentation have disrupted natural geomorphic processes. Land and lake formation associated with Mississippi River's meandering is no longer occurring or is occurring on a very limited basis, restricting the formation of new oxbow lakes and sloughs.

The refuge climate is characterized by mild winters, hot, humid summers, and abundant rainfall. Total annual precipitation averages approximately 51 inches, with the highest average rainfall occurring during the months of March through May. Summer and early fall are the driest periods, with the lowest rainfall occurring from July through October. In the summer, most rain falls in comparatively brief, yet intense, thunderstorms, which occur on about 53 days each year. For the period from 1962 to 1980 in Lauderdale County, the average annual temperature was 59 degrees Fahrenheit, with average daily temperatures ranging from 35.2 degrees in January to 79.9 degrees in July. Average annual snowfall is 9 inches. The freeze-free period, or growing season, ranges from 203 to 233 days, from late March to early November (Monteith 1990; McCowan et al., 1993).

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## DEMOGRAPHY

The rural setting and sparse population of the refuge vicinity are characteristic of west Tennessee. The immediate location of the refuge is even less populated than most of west Tennessee, due to its location adjacent to the Hatchie and Mississippi Rivers and their floodplains. Data from the 2000 census indicated that Lauderdale County had a population of 27,021 people, which is an increase of 15.4 percent since the 1990 census. The population of Tipton County, according to the 2000 census, was 52,956, an increase of 36.5 percent since 1990. See <http://cls.coe.utk.edu/counties/tipton.html>.

Per capita income recorded for Tennessee as of 2001 was \$19,393. In Tipton County, per capita income was \$17,952; in Lauderdale County it was \$13,682. Agriculture and related service companies are the main economic bases in the two counties. Several small-to-medium manufacturing companies are located in the counties, along with some of the major private employers, including Wal-Mart, Marvin Windows of Tennessee, Tennessee Electroplating, S & R of Tennessee, and Slim-Fast. Other major employers include the Lauderdale and Tipton County Schools and Baptist Memorial Hospital.

## WILDERNESS REVIEW

Refuge planning policy requires a wilderness review as part of the comprehensive conservation planning process. The Wilderness Act of 1964 defines a wilderness area as an area of federal land that retains its primeval character and influence, without permanent improvements or human inhabitation, and is managed so as to preserve its natural conditions and which (1) generally appears to have been influenced primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or primitive and unconfined types of recreation; (3) has at least 5,000 contiguous roadless acres or is of sufficient size to make practicable its preservation and use in an unimpeded condition; or is a roadless island, regardless of size; (4) does not substantially exhibit the effects of logging, farming, grazing, or other extensive development or alteration of the landscape, or its wilderness character could be restored through appropriate management at the time of review; and (5) may contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

The lands within the Lower Hatchie National Wildlife Refuge were reviewed for their suitability in meeting the criteria for wilderness, as defined by the Wilderness Act of 1964. No lands in the refuge were found to meet these criteria. Therefore, the suitability of refuge lands for wilderness designation is not further analyzed in this plan.

## THREATENED AND ENDANGERED SPECIES

Part of the Service's mission is to protect, enhance, and manage habitat for threatened and endangered species, in keeping with the enforcement of the Endangered Species Act. Three federally listed species, including the endangered interior least tern, the endangered pallid sturgeon, and the threatened bald eagle, are found on or near the refuge. The interior least tern is known to nest on Mississippi River sandbars within 1 mile of the refuge and is known to feed on refuge lands. The pallid sturgeon is known to occur within the Mississippi River. It is possible that pallid sturgeon could enter refuge lakes during high river stages; however, this has never been documented and is unlikely due to their small numbers. As many as 10 bald eagles winter annually on the refuge, although no active nests have been documented on refuge lands. There is no known federally listed flora on the refuge. A Section 7 Intra-Service Biological Evaluation addressing those species is found in Appendix 5.

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## AVIAN SPECIES

Avian species are important wildlife resources, with more than 250 species known to occur on nearby Reelfoot Refuge (USFWS 1989) and along the Hatchie River, which bisects the refuge (TNC 2000). Appendix 4 contains a list of the avian species known to occur on the refuge and their residence status. The bottomland hardwood forests serve as important habitat for breeding and migratory birds in the spring and fall, and migratory birds occur in substantial numbers seasonally. For migratory forest-breeding songbirds and shorebirds, the ecological and biological significance is transcontinental, with the refuge providing breeding and migration habitat for Gulf migratory birds returning from their wintering grounds in Central and South America.

Recent studies indicate significant declines in some species of neotropical migratory bird populations (Askins et al., 1990), while current knowledge concerning management practices for most neotropical migratory species is seriously lacking. The status of one of the most rapidly declining species, the cerulean warbler, prompted population monitoring at nearby Chickasaw Refuge during 1985 through 1987 and in 1991. Additional research began in 1992 and is ongoing to assess habitats and responses of cerulean warblers in the Mississippi Alluvial Valley (Hamel et al., 1994). Neotropical migratory birds, which regularly occur on Lower Hatchie NWR, include the cerulean warbler, the prothonotary warbler, and Swainson's warbler.

Approximately 32 species (TWRA and USFWS 2002) of shorebirds are commonly found in west Tennessee, with peak populations occurring during migrations, which typically peak from August through October and from April to mid-May (Elliott and McKnight 2000). Shorebird species common to west Tennessee include killdeer, pectoral sandpiper, solitary sandpiper, greater yellowlegs, lesser yellowlegs, common snipe, and American woodcock. Refuge lands, which provide shorebird habitat, include riverine mud bars, oxbows, flooded agricultural fields, margins of reservoirs, and managed impoundments. Presently, approximately 100 acres of refuge impoundments are managed to provide shorebird habitat.

The Lower Mississippi Valley serves as the primary wintering ground for mid-continent waterfowl populations breeding in the prairies and parklands of Canada and the United States. Lower Hatchie Refuge and adjacent lands are known to be important wintering and stop-over areas for mallards using the Mississippi Flyway. Under optimum conditions, waterfowl population numbers may exceed 150,000. The value of Lower Hatchie Refuge as a waterfowl wintering area is enhanced by its proximity to other refuges. It is within 125 miles of numerous national wildlife refuges, including Big Lake and Wapanocca to the west, White River to the south, Hatchie and Tennessee to the east, and Chickasaw, Reelfoot, Crab Orchard, and Mingo to the north. Other species known to use the areas include black ducks, gadwall, pintail, green-winged teal, blue-winged teal, widgeon, wood ducks, ring-necked ducks, and hooded merganser. Wood ducks are year-round residents and dependent on the refuge for nesting and brood-rearing habitat.

Approximately 2,629 total acres are currently managed as a waterfowl sanctuary, of which approximately 865 acres are open lands and 1,764 are forested. The open lands are managed for moist-soil or agricultural production, at an average ratio of 50:50, which varies year-to-year due to river stages and other environmental factors. Approximately 100 acres of the sanctuary are managed for shorebird habitat. Agricultural crops are raised by cooperative farming and the refuge share of crops is 25 percent (unharvested) with 75 percent (harvested) going to the farmer. Waterfowl objectives for the refuge are 500,000 goose-use days and 5.1 million duck-use days. These objectives are supported by the moist-soil units, impoundments, and flooded sloughs and brakes, as well as the entire refuge forest, much of which is subject to inundation during high river stages. These objectives are currently being evaluated in light of refuge expansions and the North American Waterfowl Management Plan.

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Wild turkeys are present on the refuge, although spring flooding has an impact on nesting success on a regular basis. Flocks consisting of upwards of 50 turkeys are observed during high-water periods, during which the birds congregate on higher ground. Mourning doves and bobwhite quail are common on open lands within and adjacent to the refuge. Common raptors include red-tailed and red-shouldered hawks, northern harriers, barred owls, and turkey and black vultures. Kestrels and broad-winged hawks are also present but occur less frequently.

## *MAMMALS*

The refuge contains a diversity of mammals, representing seven taxonomic orders, including pouched mammals (opossums); insect-eaters (shrews and moles); bats; flesh-eaters (raccoon); gnawing mammals (squirrels and mice); rabbits; and even-toed hoofed mammals (white-tailed deer).

The diverse habitat types on the refuge are very productive for a wide variety of game and nongame mammals. Appendix IV contains a list of mammalian species known to occur on the refuge. Mammalian game species hunted on the refuge include white-tailed deer, raccoon, gray and fox squirrels, coyote, and swamp and cottontail rabbit. Furbearers include raccoon, beaver, opossum, river otter, muskrat, nutria, striped skunk, coyote, bobcat, gray and red fox, and mink. Nongame species include shrews, moles, bats, and numerous rodents, such as mice, rats, chipmunks, and flying squirrels.

Providing a diversity of habitats on the refuge contributes to healthy populations of numerous mammalian species, as well as other resident animals. Habitat management practices that focus on providing habitat for migratory birds would also benefit many resident mammals. Forest thinning and regeneration cuts would provide browse for deer, and ultimately larger mast-bearing trees with a greater potential for cavities for squirrels and raccoons. Managing for a diverse forest habitat would better meet the needs of all resident mammals that are dependent on forested habitats.

## *AMPHIBIANS AND REPTILES*

A diverse group of amphibians is found on the refuge, including salamanders, toads, and frogs, and most are well adapted to the aquatic and terrestrial environments found on the refuge, with moisture being typically important for their survival. Numerous species of reptiles, including turtles, snakes, lizards, and skinks, are common as well. Appendix IV provides a list of reptiles and amphibians and their status.

Reptiles and amphibians are abundant and functionally important in most refuge freshwater and terrestrial habitats and are major components of the Lower Mississippi River ecosystem. Many species of herpetofauna are wide ranging and may serve as key indicator species in evaluating the environmental health of an ecosystem. Reptiles and amphibians known to exist on the refuge and their status in west Tennessee are listed in Appendix IV. Comprehensive inventories will be performed to establish baseline information on amphibian and reptilian species' occurrence and habitat utilization on the refuge as funds and staff are available. Knowledge of which species occur on Lower Hatchie Refuge is fundamental to an understanding of the biological diversity of the area.

A troubling indicator for the health of ecosystems worldwide is that many amphibian populations are declining. Loss and degradation of habitats are the main known causes of decline in reptile and amphibian populations in Tennessee, with the loss of wetlands and bottomland hardwood forests having the greatest negative impact on these species. Habitat fragmentation, hydrologic alteration, and excessive sedimentation are environmental problems common to west Tennessee, which negatively affect populations. Refuge land protection and management efforts serve these populations by protecting existing habitats, as well as restoring degraded habitats.

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## *AQUATIC SPECIES*

The sloughs, rivers, and lakes within the refuge support a diversity of game fishes, including largemouth bass, black crappie, white crappie, spotted bass, redear sunfish, bluegill, and channel catfish. Nongame species such as carp, buffalo, and drum are also present. Appendix IV provides a comprehensive listing of fishes likely to occur in the Hatchie River adjacent to the refuge. At least 97 native fish species have been identified within the Hatchie River, making it one of the richest fish faunas of all west Tennessee rivers (Etnier and Starnes 1993; TNC 2000).

The dynamic nature of the flooding regimes between the Mississippi and Hatchie Rivers and the associated wetland habitats on the refuge provide a constant and renewable fishery. When flooding occurs in the spring, these areas provide good nurseries for juvenile fish. Although decades of hydrologic alteration and sedimentation have impacted aquatic resources in the refuge vicinity, land protection and habitat restoration result in positive benefits to aquatic habitats and species. The Service should emphasize projects that reduce the effects of channelization and poor land use practices through programs such as the Partners for Fish and Wildlife Program, the Wetlands Reserve Program, Cropland Reserve Program, Forest Legacy, and The Nature Conservancy's Conservation Plan for the Hatchie River.

## *MUSSELS*

The Hatchie River exhibits the most diverse mussel fauna of all Mississippi River tributaries in Tennessee (Parmalee and Bogan 1998). Manning (1989) reported 32 native species as occurring in the Hatchie River during his surveys in 1980-83. In addition, surveys by The Nature Conservancy in 1999 found 3 additional species, raising the total number of known species to 35 (TNC 2000). Appendix IV provides a list of the mussel species found in the Hatchie River adjacent to the refuge.

A comprehensive mussel survey has not been completed for the refuge, and few published surveys exist of the mussels of the Mississippi River and its other major tributaries in West Tennessee. A survey by A.E. Ortmann (1926) reported 7 species of mussels from Reelfoot Lake and 12 species from the Obion River. Pilsbry and Rhoads (1896, as cited in Ortmann 1926) listed 12 species of mussels from Reelfoot Lake and 5 species from the Wolf River in Shelby County. It is estimated that approximately 20 to 25 species of mussels likely exist in the vicinity of Lower Hatchie Refuge. Common mussel species expected to exist on the refuge would include: washboard, three-ridge, pondhorn, giant floater, and cylindrical floater (pers. comm. with Don Hubbs, Tennessee Wildlife Resources Agency).

As stated in the Aquatic Resources section above, hydrologic alteration and sedimentation have impacted aquatic resources, including mussels, in the refuge vicinity. Similarly, refuge land protection and habitat restoration result in positive benefits to aquatic habitats and mussel species. The Service should emphasize projects that reduce the effects of channelization and poor land use practices. In addition, a comprehensive survey of mussel populations should be conducted in refuge and vicinity waters when funding and opportunities are available.

## *NOXIOUS AND INVASIVE SPECIES*

Noxious and/or invasive species known to present problems on the refuge include a hybrid cocklebur, hemp sesbania, and kudzu. The refuge vicinity has become home to a hybrid cocklebur that is resistant to flooding and moist-soil conditions. The species is prolific and will out-compete native moist-soil vegetation in moist-soil units. Hemp sesbania also invades the moist-soil units and will also out-compete the preferred moist-soil vegetation.

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Kudzu occurs along field and forest edges and in forest openings where direct sunlight can penetrate the forest floor. This exotic vine is a native of Asia and was introduced into the United States at the Philadelphia Centennial Exposition in 1876. By 1900, kudzu was being sold through mail order suppliers as an inexpensive livestock forage. The Soil Erosion Service distributed approximately 85 million seedlings starting in 1933 in an effort to control agricultural erosion. The U.S. Department of Agriculture removed kudzu as a cover plant and listed it as a common weed in 1970 (Shurtleff and Aoyagi 1977, Miller and Boyd 1983).

Kudzu is an aggressive vine that can grow up to 60 feet per year, forming a continuous blanket of foliage. The dense foliage often chokes out native plants and trees, alters native biotic communities, and drastically decreases biodiversity. Today, an estimated 7 million acres in the Southeast is covered in kudzu. The refuge currently has approximately 15 acres of kudzu, which are being treated for eradication.

The Draft Habitat Management Plan for the refuge includes plans and preferred methods for control and eradication of these nuisance and invasive species.

### *HABITATS*

Refuge lands provide a variety of habitat types for a diversity of wildlife species. Habitats found on the refuge consist of approximately 39 acres of open administrative land, 1,256 acres of agriculture and moist-soil open land (the agriculture/moist-soil breakdown varies from year to year), 777 acres of baldcypress/tupelo forest, 5,719 acres of mixed bottomland hardwood forest, 89 acres of grassland, 119 acres of open water, 373 acres of sandbar, 32 acres of scrub/shrub, and 1,047 acres of upland forest. The Sunk Lake Public Use Natural Area includes 3 acres of administrative lands, 274 acres of baldcypress/tupelo forest, 1,466 acres of mixed bottomland hardwood forests, and 130 acres of open water. The total current deeded acreage being managed as Lower Hatchie Refuge is 9,451 acres (February 2004). The Sunk Lake Public Use Natural Area includes a total of 1,873 acres. Figure 8 shows the existing habitat types on the refuge.

The 5,719 acres of mixed bottomland hardwoods on the Refuge consist of black willow, eastern cottonwood, overcup oak, cherrybark oak, willow oak, water oak, Nuttall oak, sugarberry, baldcypress, sweet pecan, bitter pecan, sweetgum, and green ash. Forest management practices are used in these areas to maintain optimal diversity of forest habitat for wildlife management purposes. Mast production in the bottomland hardwood habitats provides an important food source for a wide variety of wildlife, including migratory waterfowl, deer, squirrel, and turkey. During winter and spring months, backwaters typically flood thousands of acres of bottomland hardwoods, providing valuable waterfowl habitat. The Sunk Lake Public Use Natural Area contains 1,466 acres of bottomland hardwood forest with similar species composition. No forest management practices are performed on the Sunk Lake forest.

There are approximately 1,256 acres of agriculture/moist-soil open lands at Lower Hatchie Refuge. In any given year, approximately 50 percent of these lands are managed for agricultural production and 50 percent are managed for moist soil, although the ratio varies from year-to-year due to river flooding and other factors. Croplands are managed under cooperative agreements with local farmers, who grow corn, soybeans, and winter wheat in rotation. The 25 percent refuge share is usually planted in corn, which is left in the field for waterfowl consumption.

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The refuge currently contains approximately 777 acres of wooded swamp habitat, which is dominated by baldcypress and swamp tupelo in the overstory, and with buttonbush found most abundantly in the understory, as well as in the 32 acres of scrub/shrub habitat. In the 119 acres of open water habitat found on the refuge, dominant vegetation includes submerged aquatics such as elodea, curlyleaf pondweed, bladderwort, and coontail; and emergents such as American lotus, cowlily, duckweed, waterfern, and yellow pond-lily.

The Sunk Lake Public Use Natural Area contains 274 acres of wooded swamp (baldcypress and water tupelo) habitat and 130 acres of open water habitat, similar in vegetative composition to that found on the refuge.

Approximately 373 acres of sandbar habitat is found on the refuge, primarily adjacent to the Mississippi River, along the western boundary. Vegetation is essentially lacking on the sandbars as these areas are intermittently submerged. Upland hardwood forest habitat (approximately 1,047 acres) is found primarily along the Chickasaw bluff on the eastern edge of the refuge and in a large tract in the western portion. The upland forest consists primarily of southern red oak, sweet gum, yellow poplar, post oak, white oak, various hickories, and American beech.

Approximately 89 acres of grassland on high ground adjacent to the Mississippi River bluff is managed as grassland. Dominant species include switchgrass, little bluestem, big bluestem, broomsedge, partridge pea, Indian grass, goldenrod, common ragweed, and giant ragweed.

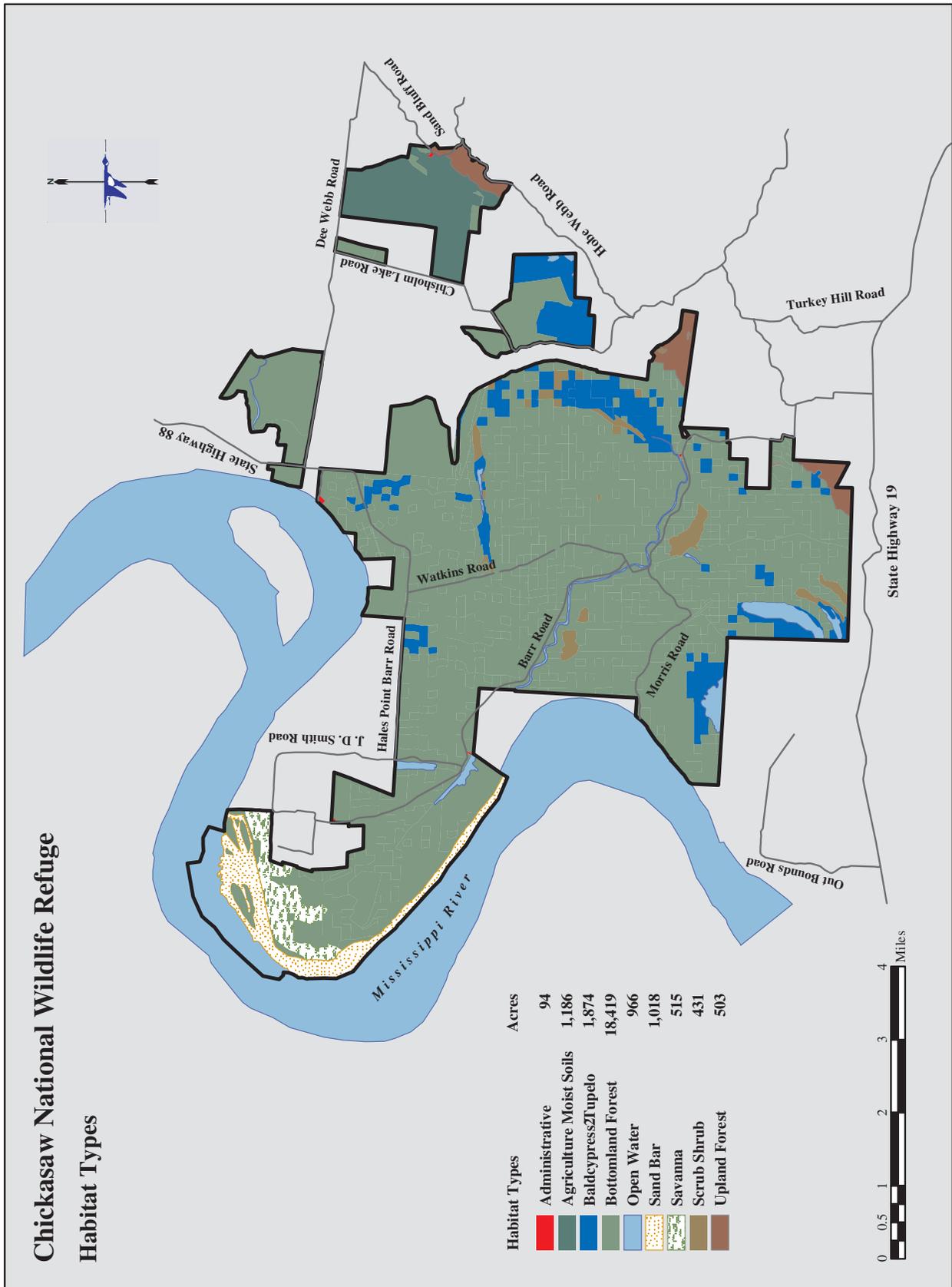
#### *EDUCATION AND VISITOR SERVICES*

Since the passage of the National Wildlife Refuge System Improvement Act of 1997, the refuge has adopted hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation as the priority general public uses. These uses, as such, are management's primary focuses and over time programs would be developed to increase visitor awareness and appreciation of fish and wildlife resources.

Wildlife-dependent recreation currently available on the refuge includes wildlife observation (by hiking, boating, or driving on established roads), hunting, fishing, and photography. Hunting and fishing have been the primary uses on the refuge since its inception and encompass the majority of public use. The staff provides environmental education and interpretive programs when requested by local civic and school groups. Currently, there are two informational kiosks on the refuge.

In Fiscal Year 2003, the refuge received approximately 80,000 visitors, although visitor use data are limited. The refuge is open during most of the State hunting seasons, with some exceptions and certain restrictions, which apply to certain hunts. Fishing is permitted all year according to State regulations, with certain restrictions. By law, national wildlife refuges are closed to public use activities unless expressly permitted. At Lower Hatchie Refuge, hunting, fishing, and wildlife observation and wildlife photography are permitted on most areas. All public access is prohibited to the 2,629-acre sanctuary from November 15 through March 15. About 6 miles of trails are maintained for foot hunting access, wildlife observation, wildlife photography, and hiking. The Sunk Lake Public Use Natural Area is open to nonconsumptive forms of wildlife-dependent recreation, including wildlife observation and wildlife photography. Sunk Lake is also open to fishing, and a portion of the area is open to small game and archery deer hunting, in season. Figure 9 shows the existing public use facilities found at Lower Hatchie Refuge and Sunk Lake Public Use Natural Area.

Figure 8. Existing Habitat Types on Chickasaw National Wildlife Refuge



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There are numerous other public lands within commuting distance that offer wildlife-dependent recreation experiences. Five other national wildlife refuges, including Reelfoot (10,428 acres), Lake Isom (1,850 acres), Chickasaw (25,006 acres), and Hatchie (11,556 acres), are located within a 2-hour drive of Lower Hatchie Refuge. Reelfoot National Wildlife Refuge offers a diverse interpretive and environmental education program, including tours to observe concentrations of up to 200 bald eagles, as well as concentrations of ducks and geese, which winter in the Reelfoot Lake area. Hatchie Refuge provides excellent birding opportunities within the scenic Hatchie River bottoms. The Hatchie River, which traverses through both Hatchie and Lower Hatchie Refuges, is a State-designated scenic river and is the only unchannelized river remaining in west Tennessee.

### *REFUGE ADMINISTRATION*

Refuge administration refers to the operation and maintenance of refuge programs and facilities, including new construction. The staff currently consists of three permanent employees, whose efforts are primarily focused on protection and restoration of critical habitats, especially bottomland hardwood forests, through land acquisition, and forest management. The draft Habitat Management Plan provides an inventory of existing forest resources and long-term plans for management of these resources to maximize their value as habitat for a diversity of wildlife species. Of particular concern, under management activities, is providing quality habitats for migratory birds.

The staff also coordinates extensively with landowners, conservation organizations, local agencies, and civic groups, and attends meetings and provides presentations as needed to local groups. The staff's current public information efforts concentrate on land acquisition efforts and keeping the public informed regarding public use opportunities and refuge activities.

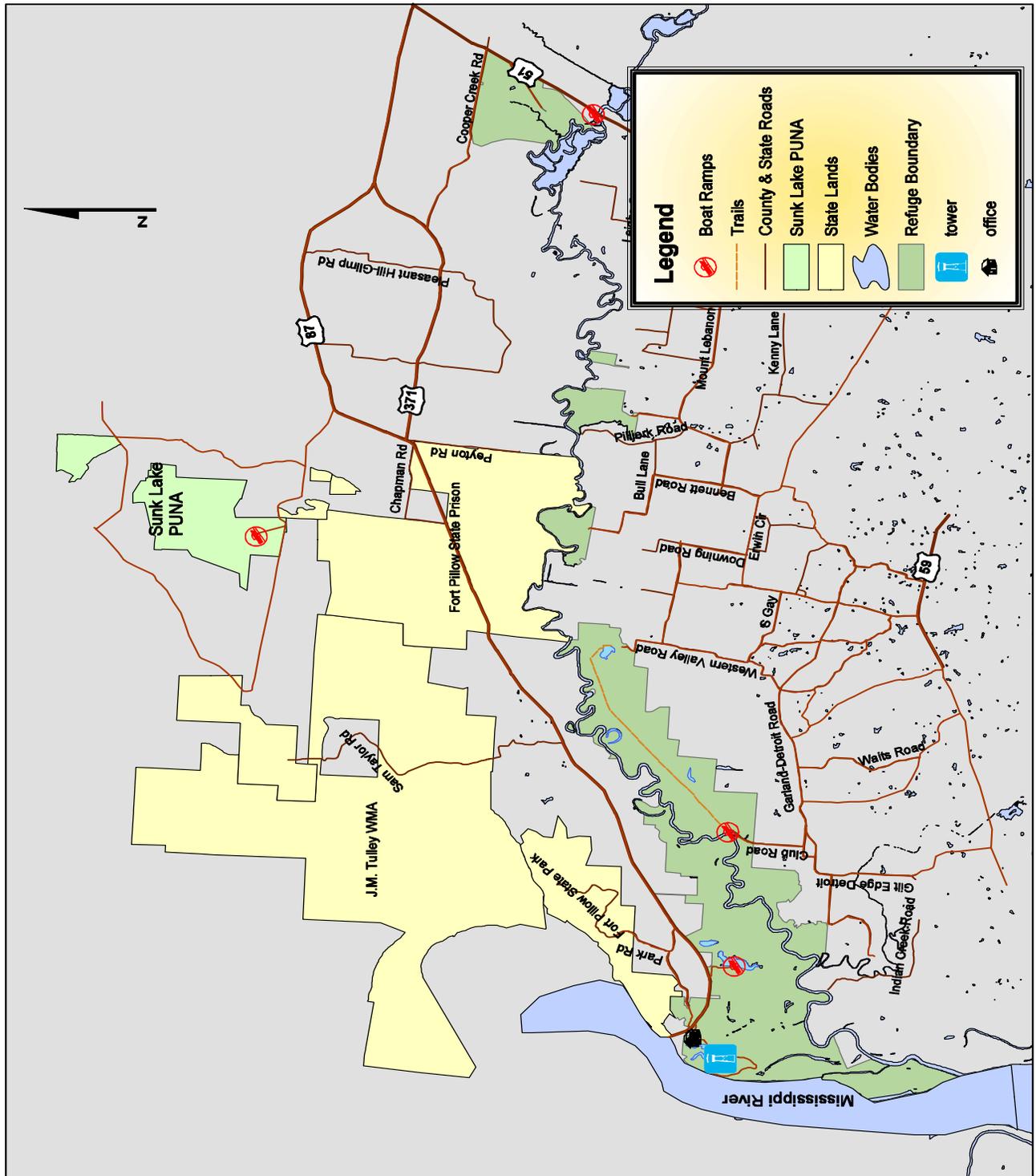
The staff maintains one administrative site, the main headquarters located on Fort Prudhomme Road. The administrative site contains an office trailer, one general storage shed, one safety storage shed for hazardous materials, two pole sheds, one maintenance shop, two camper pads, and facilities for temporary personnel (volunteers, interns, researchers, etc.).

Lower Hatchie Refuge is surrounded by a network of roads that facilitate access to different areas of the refuge. State Highway 87 West runs from U.S. Highway 51 to the refuge (approximately 17 miles). Much of the refuge is accessible through county-maintained road systems including Tipton County roads, which provide access to the portions of the refuge south of the Hatchie River, and Lauderdale County roads, which access the refuge north of the Hatchie River. County roads that provide access to various parts of the refuge include the Jack Crutcher Road, the Champion Lake Road, Club Road, and the Fort Prudhomme Road. Public use facilities include a fishing pier, boat ramp, and parking area at Champion Lake, a public observation tower overlooking the waterfowl sanctuary, a fishing pier at Teal Pond, a boat ramp on the Hatchie River (off of Club Road) in Tipton County, and a gravel parking area at the Mississippi River. In addition, the Fort Prudhomme Wildlife Drive leads from the headquarters area to the Mississippi River and covers approximately 1 ½ miles.

The Sunk Lake Public Use Natural Area is accessible from Sunk Lake Road, which intersects State Highway 87. Sunk Lake facilities include a boat ramp, an access road, and a boardwalk.

In addition to normal refuge road maintenance activities, the 1998 Transportation Equity Act for the 21<sup>st</sup> Century (TEA-21) provides funding for National Wildlife Refuge System roads under the Federal Lands Highway program. The staff of the West Tennessee National Wildlife Refuge Complex is coordinating with Federal Highway Administration officials to assess Lower Hatchie Refuge roads for

Figure 9. Public Use Facilities at Lower hatchie Nation Wildlife Refuge



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possible enhancements or improvements utilizing TEA-21 funding. Congress requires that projects must be compatible with comprehensive management plans and must minimize impacts on refuge operations. The Federal Highway Administration is available to assist the Service in planning, designing, and contracting under this program. Items proposed for immediate work (2005 to 2010) under the TEA-21 grant funding process include rehabilitation of the Fort Prudhomme Road, the Champion Lake Road and parking area, Shankle Lake Road, the Mississippi River Road and parking area, and the Burlison Road and parking areas.

### *ARCHAEOLOGICAL OR HISTORIC RESOURCES*

Before the area was colonized by Europeans, the Chickasaw Indians occupied the portion of western Tennessee that includes the Lower Hatchie Refuge. Initial European explorations included visits by the Spanish explorer De Soto in 1540 and the French explorer La Salle, who made contact with the Chickasaw Indians in the vicinity of the current Fort Pillow State Park in 1682 (Anderson 1995). After the American revolution, the lands occupied by the Chickasaw were ceded to the new United States government, which made peace with the Chickasaw in 1786. In 1818, the Chickasaw Nation ceded all claim to lands in Tennessee, and, in 1837, all remaining Chickasaw Indians east of the Mississippi were removed to the west.

Archaeological investigations on Lower Hatchie Refuge include one survey conducted in 1992, in response to the uncovering of prehistoric artifacts by a road grader on refuge property. This investigation discovered the remains of a single component of a prehistoric village, indicating Mississippian period use between approximately A.D. 1400 and A.D. 1500. Subsequent investigations found the remains of several prehistoric houses, human burial sites, and numerous other cultural artifacts (Mainfort 1992). The sites and artifacts were identified, catalogued, and assessed by the Division of Archaeology of the Tennessee Department of Environment and Conservation. The survey recommended that the site be tested and evaluated for inclusion in the National Register of Historic Places. The locations of all discovered cultural resources were mapped, and it was determined that these site areas should be avoided by all heavy earthmoving equipment.

Numerous other archaeological investigations have been conducted within nearby portions of west Tennessee. Significant surveys performed in west Tennessee include Mainfort (1994), in which archaeological investigations were made within the nearby Obion River drainage, and Dickson and Campbell (1979), which surveyed cultural resources on Reelfoot and Lake Isom Refuges. These reports document an area rich in prehistoric and historic cultural resources, dating back as far as 12,000 B.C. Numerous other smaller archaeological resource studies have been conducted in west Tennessee in conjunction with various Federal development projects.

Prior to refuge ownership, levee and road construction, as well as agricultural activities, may have adversely impacted archaeological deposits associated with many sites on the refuge. Since it is likely that numerous other undisturbed sites exist on the refuge, the survey recommended that the Service conduct additional archaeological surveys throughout the refuge to assist in future project management. In addition, oral history interviews and documentary research could provide a wealth of information regarding the refuge and the county.

### *LAND PROTECTION AND CONSERVATION*

Of the total approved refuge acquisition of 23,229 acres, the Service has acquired an additional 9,451 acres for the refuge to date (June 1, 2004), leaving a balance of 13,778 acres in private ownership within the approved acquisition boundary. The staff is focusing on land acquisition within the approved acquisition boundary. Land protection goals set for the refuge would support strategic

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growth in areas where there is greatest concern, mainly lands identified for migratory waterfowl and songbirds. The Sunk Lake Public Use Natural Area includes 1,873 additional acres, which are protected under a renewable lease agreement with the State of Tennessee.

All tracts acquired by the Service are removed from the local real estate rolls, because Federal Government agencies are not required to pay State or local taxes. However, the Service makes annual payments to Tipton and Lauderdale Counties in lieu of real estate taxes, as required by the Refuge Revenue Sharing Act (Public Law 95-469). Payment for acquired land is computed on whichever of the following formulas yields the greatest result: (1) three-fourths of 1 percent of the fair market value of the lands acquired in fee title; (2) 25 percent of the net refuge receipts collected; or (3) 75 cents per acre of the lands acquired in fee title within the county.

Of the 324,570 acres in Lauderdale County, 192,010 acres consist of cultivated crop lands, and 92,600 acres consist of forests. Tipton County encompasses 303,821 acres, of which 169,788 acres consist of cultivated crop lands and 70,600 acres consist of forests. There are approximately 505 farms in Lauderdale County (average size of 380 acres) and approximately 592 farms in Tipton County (average size 287 acres). Source: USDA website:

[www.nass.usda.gov/tn/tncityest/ctymap.html](http://www.nass.usda.gov/tn/tncityest/ctymap.html). Lands immediately adjacent to the refuge are privately owned and managed for farmland and hunting clubs. The surrounding farmland is farmed primarily for soybeans, cotton, wheat, corn, and milo. Farm commodity prices, in general, have decreased since the mid-1980s and more dramatically since the passage of the 1996 Farm Bill. Poor farm production, drought, and low commodity prices in recent years have encouraged many producers to sell their farms and/or enroll them in some kind of conservation program.

Private lands enrolled in conservation programs contribute significantly to wildlife conservation. In 2000-2001, Lauderdale County claimed 11,593.4 acres in the Conservation Reserve Program (CRP) (Source: pers. comm. with Donna Neal, Lauderdale County Farm Service Administration) and Tipton County claimed 5,091.1 CRP acres (Source: pers. comm. with Glenn Zarecor, Tipton County Farm Service Administration). As of 2003, Lauderdale County claimed 239.9 acres in the Wetlands Reserve Program (WRP) (Source: pers. comm. with Dwayne Johnston, Natural Resources Conservation Service, Ripley, Tennessee), while Tipton county claimed 2,844.8 WRP acres for 2003 (Source: pers. comm. with Natural Resources Conservation Service office, Covington, Tennessee). The Fish and Wildlife Service has an active partnership with several agencies and organizations to enroll private lands in these programs; and private land enrollment in conservation programs would continue to be encouraged to augment Service program and mission requirements.

A study of contaminants occurring on 26 national wildlife refuges in the Lower Mississippi River Ecosystem (LMRE) was conducted by North Carolina State University (Shea et al., 2001). Samples of water, sediment, and fish were collected, and sampling devices that accumulate persistent organic chemicals were employed. Organochlorine pesticides (OCPs) (including DDTs, toxaphene, mirex, endrin, dieldrin, and numerous other pesticides) were detected at every refuge, but on Lower Hatchie Refuge, total levels of DDT and toxaphene were well below published levels for the protection of fish or wildlife in both predator and benthic fish species. Mixtures of multiple pesticides were often detected in LMRE refuges, and their detection frequency was clearly associated with their use and persistence. Total polychlorinated biphenyl (PCB) values in sampled predator and benthic fish and in sampled sediment and water were well below published levels for the protection of fish. Total polycyclic aromatic hydrocarbons (PAHs) in sediment and water samples were low throughout the region, except near oil and gas production facilities, which do not occur on or near Lower Hatchie Refuge. Mercury levels in sediment and predator and benthic fish samples were well below threshold levels for effects on fish-eating mammals and birds. Current use pesticides (include the herbicides 2,4-D, atrazine, and numerous others; and the insecticides diazinon, malathion, and numerous

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others) were detected at every refuge, but at only one-half the frequency as they were at nearby off-refuge areas. On Lower Hatchie Refuge, water samples indicated the presence of three current use pesticides, at levels below those that would endanger aquatic life. Even on nearby lands outside the refuge, current use pesticides were not found at levels that exceeded aquatic life criteria. However, according to the Shea study, hazards associated with current use pesticides are uncertain due to limitations of sampling techniques. Additional data are probably necessary to perform a quantitative risk assessment (Shea et al., 2001). In summary, Lower Hatchie Refuge tests indicated no likely hazard in regard to PAHs, but further testing may be needed to accurately determine possible risks associated with OCPs, PCBs, and CUPs.

### *REFUGE-RELATED PROBLEMS*

Bottomland hardwood forests within the Mississippi Alluvial Valley (MAV) provide habitat for a rich diversity of wildlife species. Of 24 million acres of once-forested wetlands originally in the MAV, only about 5 million acres remained forested by 1978 (MacDonald et al., 1979). Today, more than 80 percent of the MAV lands are in agricultural production (Twedt et al., 1999). Remaining forested lands are typically isolated patches surrounded by agriculture. More than 35,000 forest patches exist in the MAV, of these, the average size is less than 100 acres, and less than 1 percent is greater than 10,000 acres. Agricultural practices in the vicinity of Lower Hatchie Refuge have resulted in large-scale clearing and fragmentation of bottomland hardwood forests, which equate to significant losses and degradation of valuable wildlife habitat.

Lower Hatchie Refuge was formerly owned by a variety of landowners, including Anderson-Tully Timber Company, agriculture interests, and private landowners. The core area of the existing waterfowl sanctuary was farmed, while the majority of the remainder was in timber or smaller farms. A forest habitat inventory is being compiled in conjunction with the draft Habitat Management Plan for the refuge. The relative newness of the refuge, as well as the limited operation and maintenance funds available to date, has played a significant role in the lack of inventory information thus far. Comprehensive surveys of refuge fauna should be completed as funding and opportunities are available.

Massive navigation and flood-control works have severely impacted the natural processes of the two major rivers adjacent to the refuge. The Mississippi River has been straightened and channelized for decades, significantly reducing the meanders of the natural river channel and limiting the amount of over-bank flooding to less than that which occurred historically. Even though the main stem of the Hatchie River has never been channelized, numerous channelized tributaries affect the river's hydrology through the deposit of huge sediment loads. As a result, the physical and biological interaction between the rivers and floodplain has been impacted, and much of the natural hydrologic functioning of the system has been affected significantly. Lauderdale and Tipton Counties are among the few remaining areas along the Mississippi River where the main line levee is incomplete, which allows high-river stages to inundate much of the refuge lands on a regular basis. While this seasonal inundation is beneficial, the natural hydrology has been significantly altered by agricultural and flood control interests, and so natural hydrology is severely impacted nonetheless.

### *CONSERVATION PRIORITIES*

Priorities identified for Lower Hatchie Refuge include continued emphasis on habitat for migratory waterfowl and for bottomland hardwood forests, and an increased emphasis on habitat for migratory songbirds.

The importance of the Lower Mississippi Valley as the primary wintering ground for mid-continent waterfowl populations serves to reinforce the value of the refuge for migrating waterfowl. The refuge and adjacent lands are known to be an important wintering and stop-over area for mallards using the

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Mississippi Flyway, and the value of the refuge as a waterfowl wintering area is enhanced by its proximity to other refuges. The refuge was authorized by the Migratory Bird Conservation Act of 1929 for "... use as an inviolate sanctuary or for other management purposes, for migratory birds." Management of impoundments, agricultural lands, moist-soil units, and bottomland hardwood forests would be carried out with an emphasis on providing habitat for migrating waterfowl.

The vast amount of clearing and fragmentation of forests in the MAV underscores the importance of the refuge as a part of the largest complex of bottomland hardwood forests remaining in west Tennessee. A priority is placed on protection and maintenance of bottomland hardwood forests on the refuge, as well as the reforestation of most of the newly acquired open lands. Refuge forest management activities are working to maintain and increase the red oak component of the forest and develop a forest structure, which provides a diversity of habitats for numerous species of wildlife.

Significant declines in populations of many neotropical songbirds serve to emphasize the importance of forest habitats for species, which migrate through the Lower Mississippi Valley. Emphasis would continue to be placed on the study and management of refuge forests for these species. Management efforts to enhance existing forests for songbirds would continue to be a priority on the refuge. Migratory birds, which are considered to be focal species for the refuge, include the swallow-tailed kite, cerulean warbler, and Swainson's warbler.

Focal wildlife species would continue to be managed in support of goals and objectives developed for the Lower Mississippi River Ecosystem (USFWS Ecosystem Plan 2000). Resource goals and objectives developed cooperatively with the State of Tennessee (TWRA and USFWS 2002) would continue to be a priority in the future planning and management of refuge lands. The Service would continue to work with partners and landowners to achieve common goals and form conservation partnerships. Sunk Lake Public Use Natural Area would continue to be managed through a cooperative relationship with the Tennessee Department of Environment and Conservation. One other such partnership involves the Natural Resources Conservation Service. Landowner participation in the Wetlands Reserve Program and the Cropland Reserve Program would assist the Service in meeting wildlife objectives through land restoration in the vicinity of the refuge.



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## *IV. Management Direction*

### **INTRODUCTION**

The Service endeavors to manage fish and wildlife and their habitats, while considering the needs of the complete spectrum of natural resources in the decision-making process. But first and foremost, fish and wildlife conservation assumes priority in refuge management. A requirement of the National Wildlife Refuge System Improvement Act of 1997 is for the Service to maintain the ecological health, diversity, and integrity of national wildlife refuges. Refuges in the Lower Mississippi Valley include managed bottomland hardwood forests and moist-soil areas, and are vital links in the overall function of the ecosystem. To offset the historic and continuing loss of these habitats within the ecosystem, the refuge and other public lands provide the biological “safety net” for migratory nongame birds and waterfowl, threatened and endangered species, and resident species.

### **REFUGE VISION**

Wildlife and biological communities found on the refuge form the basis for the future management of refuge lands. The following vision statement developed collaboratively by the planning team, with input from the refuge staff and the public, describes the desired future conditions and management emphasis for the Lower Hatchie Refuge:

*With a continued emphasis on wintering waterfowl and other migratory birds, in accordance with the purpose for which the refuge was established, to protect, restore, enhance, and manage, a unique remnant of the riverine bottomland hardwood ecosystem that once dominated the Mississippi Alluvial Valley, to provide for critical habitat needs for fish and wildlife, and to provide a broad spectrum of opportunities for visitors to appreciate its diverse biological resources.*

### **REFUGE GOALS**

The following nine goals were developed in keeping with the vision for the refuge and the purposes for which the refuge was established.

Goal 1 (waterfowl): Provide a complex of managed wintering and migration habitats for waterfowl that support the population goals and objectives established in the North American Waterfowl Management Plan, the Lower Mississippi Valley Joint Venture Plan, and the WTWR Conservation Plan.

Goal 2 (endangered and threatened species): Protect, manage, and enhance refuge habitats in a manner that will sustain or increase species’ populations.

Goal 3 (migratory landbirds): Provide a complex of habitats, which meet the breeding, migration, and wintering needs of the species of management concern, as identified in the goals and objectives of the Partners-in-Flight (PIF) plan and the WTWR Conservation Plan.

Goal 4 (shorebirds and waterbirds): Provide a complex of managed habitats for shorebirds and waterbirds during critical periods throughout the year to increase bird use on the refuge and develop a traditional use site.

Goal 5 (aquatic resources): Maintain or improve aquatic habitat quantity, quality, and diversity to sustain or increase population levels of aquatic resources on the refuge in accordance with the WTWR Conservation Plan and other Service aquatic resource plans.

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Goal 6 (resident wildlife): Provide a complex of habitats suitable for a wide range of resident (endemic) wildlife species, including mammalian, avian, amphibian, and reptilian species, while achieving habitat management objectives and biological integrity with other native flora and fauna.

Goal 7 (public use): Enhance public use of the refuge through development of an appropriate and compatible program of wildlife-dependent recreation and education/interpretation that is consistent with the National Wildlife Refuge System Improvement Act of 1997 and that will promote an understanding of the Lower Mississippi River Valley ecosystem.

Goal 8 (administration and operation): Ensure that present and future operational, administrative, and personnel objectives are achieved in order that goals and objectives for refuge habitats, fish and wildlife populations, land conservation, and visitor services will be achieved.

Goal 9 (land protection and conservation): Protect natural and cultural resources through partnerships and land acquisitions and in accordance with Federal and State historic preservation legislation and regulations.

### **COMPREHENSIVE CONSERVATION PLAN - SUMMARY STATEMENT**

This proposed management plan was derived from Alternative D of the Environmental Assessment. The refuge would be managed using an ecosystem management approach that preserves the environmental health and diversity of natural resources on the refuge. At the same time, opportunities would be examined to allow greater access for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

During the planning process, oral and written comments received conveyed both a desire for increased public access and recreation and a desire to preserve the diverse flora and fauna of the refuge. The decisions to allow or prohibit certain uses were dependent upon the compatibility of those uses (whether the proposed uses would have an adverse effect on the natural resources of the refuge), the establishing purposes for the refuge, and the professional judgment of the refuge staff and planning team.

This management plan outlines how wildlife and habitats would be managed and enhanced by the refuge over the next 15 years. The goals, objectives, and strategies acknowledge that the refuge is a portion of the much larger Lower Mississippi River Ecosystem. The actions considered and taken in implementing this plan would affect the remaining Lower Mississippi River Ecosystem, natural areas which surround the Refuge, and nearby municipalities and landowners.

Crucial elements of this plan include managing wintering and migration habitats for wintering waterfowl and other migratory birds. Management of moist soil units, crop lands, and bottomland hardwood forests, as well as acquisition and management of additional lands, would ensure that the refuge supports the population goals and objectives established in numerous regional plans, including the North American Waterfowl Management Plan, the Lower Mississippi River Joint Venture Plan, and the WTWR Conservation Plan. Waterfowl impoundments, including moist-soil units and flooded fields, would be managed to provide seasonal habitat for migratory shorebirds in support of the WTWR Conservation Plan and the Shorebird Management Manual.

Protection and management of refuge forests and grasslands would support target populations of migratory land birds and support population goals and objectives established in the Partners-in-Flight Plan and the WTWR Conservation Plan. Refuge land acquisitions and cooperative efforts with other agencies and non-governmental organizations would work to assemble a 100,000-acre block of contiguous bottomland hardwood forest within the mid-Tennessee Bird Conservation Area boundary.

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Active forest management would maximize the ability of the refuge forest lands to benefit all resident and migratory species. Protection of aquatic resources would promote self-sustaining fish populations and aquatic habitats necessary for resting, foraging, and breeding, and for resident and migratory wetland-dependent wildlife species. Inventorying and monitoring of threatened and endangered species would continue, and resource protection and management would contribute to their recovery.

The environmental education and outreach program would be enhanced to showcase the Lower Mississippi River Ecosystem, and a wide range of partnering opportunities would be actively pursued and fostered to share in the protection of natural and cultural resources. Public use facilities, including a visitor center, boat ramps, observation platforms, kiosks, and trails, would be developed to enhance public access and appropriate and compatible wildlife-dependent recreation.

## **GOALS, OBJECTIVES, AND STRATEGIES**

The goals, objectives, and strategies presented below are the Service's response to the issues and concerns expressed by the planning team or by the public at open meetings, and to other comments submitted by the public. All issues discussed during the scoping process are listed in Appendix VII, and responses to relevant comments received, will be addressed in the final CCP. Following each goal is a list of objectives, and under each objective is a listing of strategies. The Plan Implementation section shows the support projects for the goals in priority order.

These objectives and strategies reflect the Service's commitment to achieve the mandates of the National Wildlife Refuge System Improvement Act of 1997, the mission of the National Wildlife Refuge System, the Lower Mississippi River Ecosystem Plan, the North American Waterfowl Management Plan, the WTWR Conservation Plan, the Conservation Plan for the Hatchie River, the refuge's vision, and the specific purposes for which Lower Hatchie Refuge was established, as well as other relevant regional and national plans. With adequate staffing and funding, as outlined in the Plan Implementation section, the Service intends to accomplish these goals, objectives, and strategies during the next 15 years.

Goals and objectives in this plan are designed to contribute to the population goals and objectives established in regionally, nationally, and internationally significant management plans, including the North American Waterfowl Management Plan, Lower Mississippi Valley Joint Venture Plan, Partners-In-Flight, Shorebird Management Manual, Lower Mississippi River Ecosystem Plan, WTWR Conservation Plan, the Conservation Plan for the Hatchie River Watershed, and other plans relevant to the Lower Mississippi River Valley.

### *GOAL 1, WATERFOWL:*

Provide a complex of managed wintering and migration habitats for waterfowl that support the population goals and objectives established in the North American Waterfowl Management Plan, Lower Mississippi Valley Joint Venture Plan, and the WTWR Conservation Plan.

Objective 1.1: Through the management of existing refuge lands and resources, as well as acquisition from willing sellers, development, and management of additional lands identified in the current approved acquisition boundary, provide migration and wintering habitats to support 5.1 million duck-use days and 500,000 goose-use days annually, based on a 110-day wintering period, in addition to year-round habitat for resident wood ducks.

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Guidelines for minimum duck-use days were developed by the use of a series of step-down plans, starting with population objectives developed in the North American Waterfowl Management Plan. These values were stepped down to the Lower Mississippi Valley Joint Venture, which, in turn, determined minimum foraging requirements that needed to be met to support the established goals of the North American Waterfowl Management Plan, and these foraging requirements were then allocated to each State within the Joint Venture. Within each State, coordination meetings were held to allocate the needed habitat requirements among public and private lands. Taking into account sanctuary and foraging requirements, public land managers determined what potential existed on various managed lands to meet the State objectives. For Lower Hatchie Refuge, these potential objectives were adjusted based on multi-species duck life history requirements, goose life history requirements, and refuge purposes and capabilities.

Strategy 1.1.1: Maintain the current core waterfowl management area (2,629 acres) as an inviolate sanctuary for waterfowl and other migratory birds where few, if any, disturbance factors are allowed during the critical winter period (November to March).

Strategy 1.1.2: Manage 1,256 acres of moist-soil/agricultural areas, through water manipulation, as well as mechanical and chemical treatments, to provide quality moist- soil habitat and high-energy food resources for waterfowl.

Strategy 1.1.3: Manage refuge forests to increase the red oak component on suitable sites in the red oak and potential red oak management units to 60 percent of the basal area.

Strategy 1.1.4: Continue afforestation efforts and establish red oak and other mast species on newly acquired lands that are not scheduled for water management development.

Strategy 1.1.5: In cooperation with private, State, and Federal partners, establish a contiguous block of forest within the approved acquisition boundary that contains 20,684 acres and connects to other conservation lands under the designated 100,000-acre MAV Bird Conservation Area.

## *GOAL 2, ENDANGERED AND THREATENED SPECIES:*

Protect, manage, and enhance refuge habitats in a manner that will sustain or increase species' populations.

Objective 2.1: Enhance, restore, protect, and manage imperiled species' habitat using appropriate conservation tools, including habitat management on 9,451 acres of existing refuge lands.

Part of the Fish and Wildlife Service mission is to protect, enhance, and manage habitat for threatened and endangered species, in compliance with the Endangered Species Act. Refuge resource management emphasizes the protection of threatened and endangered species, and efforts to protect and manage these habitats will be conducted.

Strategy 2.1.1: Provide habitat to support the recovery of the threatened bald eagle through approved land acquisitions and resource management actions.

Strategy 2.1.2: Provide feeding sites on refuge lands for interior least terns and cooperate with other resource agencies in minimizing disturbance to interior least tern nesting colonies on Mississippi River sandbars adjacent to the refuge.

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Strategy 2.1.3: Provide technical assistance to other Service divisions or resource agencies concerning efforts to restore or enhance Mississippi River or Hatchie River habitats, which may be suitable for pallid sturgeon.

Strategy 2.1.4: Enhance, restore, protect, and manage imperiled species' habitat using all available conservation tools, including habitat management on existing lands (Federal, State, and private), conservation easements, partnership agreements, conservation agreements, and land acquisition from willing sellers.

*GOAL 3, MIGRATORY LAND BIRDS:*

Provide a complex of habitats, which meet the breeding, migration, and wintering needs of the species of management concern, as identified in the goals and objectives of the Partners-in-Flight plan and the WTWR Conservation Plan.

Objective 3.1: Through acquisition and management of up to 23,229 acres of refuge land, provide sufficient habitat to support species of management concern, and work with partners toward the assemblage of a 100,000-acre block of forested land in west Tennessee within the next 15 years.

To support the establishment of sustainable populations of interior-nesting migratory songbirds, Partners-in-Flight and its cooperating partners have mapped blocks of forest that could provide appropriate habitat. The MAV Migratory Bird Conservation Plan has identified 101 areas that, with varying amounts of reforestation, could become contiguous forest patches of 10,000, 20,000, or 100,000 acres. Resource professionals believe that forest patches in these categories are the minimum sizes suitable to support breeding populations of various neotropical songbirds. In some cases, even larger forest patches may be needed to support breeding neotropical songbird populations, where the shape and/or isolation of a particular forest patch may dictate the need for even larger forest acreage. Lower Hatchie Refuge is located in one of only thirteen 100,000-acre forest blocks designated by Partners-in-Flight within the Lower Mississippi River Valley (LMRV). According to its research, a typical 100,000-acre block contains 84,000 acres of core habitat capable of supporting the species most dependent upon large forest blocks, including swallow-tailed kites, red-shouldered hawks, broad-winged hawks, pileated woodpeckers, and Cooper's hawks (Mueller et al., 1999). These large forest blocks also are expected to support other less area-sensitive, forest-nesting migratory birds as well. Map 5 shows the mid-Tennessee Bird Conservation Area, as designated by Partners-in-Flight.

Strategy 3.1.1: In cooperation with private, local, State, and Federal partners, establish a contiguous block of forest within the approved acquisition boundary that contains 20,684 acres and connects to other conservation lands under the designated 100,000-acre forest block.

Strategy 3.1.2: Develop and maintain a diversity of bottomland hardwood forest structure through sound silvicultural management.

Strategy 3.1.3: Manage upland forests to provide quality habitat for migratory birds.

Strategy 3.1.4: Manage 89 acres of grasslands to provide quality habitat for migratory land birds and provide additional grassland habitat where appropriate on newly acquired lands.

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#### *GOAL 4, SHOREBIRDS AND WATERBIRDS:*

Provide a complex of managed habitats for shorebirds and waterbirds during critical periods throughout the year to increase bird use on the refuge and develop a traditional use site.

Objective 4.1: Provide a minimum of 100 acres of shorebird habitat during spring migration, 30 acres during fall migration, and a minimum of 20 acres of waterbird habitat during summer in managed impounded wetlands, within 3 years of this plan's approval.

Shorebirds annually migrate through the LMRV from the southernmost parts of South America to the northernmost parts of North America. Foraging habitat (mudflats and shallow water areas) objectives were recommended for fall migrating shorebirds by the U.S. Shorebird Working Group, and a smaller group of shorebird experts working in the LMRV (Elliott et al., 2001). These ecosystem objectives were then stepped down to private and public lands.

Foraging habitat is not considered limiting during the spring migration, when river stages are typically falling and mudflats are common throughout the LMRV, but fall habitats can be critical due to the lack of available sheet water along the flyway. However, the WTWR Conservation Plan identified zero acres of fall shorebird habitat for Lower Hatchie Refuge. To compensate for this absence of habitat, management activities aimed at waterfowl commonly provide fall foraging opportunities for shorebirds. Refuge complex staff recognized this opportunity to provide habitat; thus, refuge management schemes have been implemented to furnish additional acreage during the critical fall shorebird migration period.

Strategy 4.1.1: Manage a minimum of 100 acres of shallowly flooded mudflat habitats with less than 25 percent vegetative cover and varying water levels, up to 8 inches, to support shorebirds during spring migration (March to early June).

Strategy 4.1.2: Provide a minimum of 30 acres of shallowly flooded mudflat habitats with less than 25 percent vegetative cover and varying water levels, up to 8 inches, during fall migration (late June to October).

Strategy 4.1.3: Identify a minimum of 20 acres of impounded wetlands in management unit 8 (Map 3) to provide shallow water feeding areas for wading birds and marsh birds during summer.

#### *GOAL 5, AQUATIC RESOURCES:*

Maintain or improve aquatic habitat quantity, quality, and diversity to sustain or increase population levels of aquatic resources on the refuge in accordance with the WTWR Conservation Plan and other Service aquatic resource plans.

Objective 5.1: Conserve, restore, and manage up to 151 acres of open water wetlands (e.g., lakes, sloughs, and side channels) and 5,852 acres of seasonally flooded bottomland hardwood forest to provide resting, foraging, and breeding habitats for resident and migratory wetland-dependent wildlife species, including native fish and invertebrates; and provide opportunities for recreational harvest of selected fish species on the refuge.

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Most of the refuge lies within the floodplain of the Mississippi and Hatchie Rivers, which regularly flow through the refuge when the rivers reach flood stage. The dynamic nature of this flooding regime and the associated wetland habitats provide diverse and renewable resources within the numerous aquatic features on the refuge. The creeks, sloughs, and lakes within the project areas support a diversity of game and nongame fishes. When flooding occurs in the spring, these areas provide good nurseries for juvenile fish, breeding areas for frogs and toads, and feeding areas for reptiles. Through conservation, restoration, and management of lands and aquatic resources, critical habitats are made available for resting, foraging, and breeding for resident and migratory wetland-dependent and aquatic wildlife species.

Strategy 5.1.1: Restore and maintain natural secondary channels, oxbows, natural banks, sloughs, and backwater areas that connect to the Hatchie River and Mississippi River on the refuge.

Strategy 5.1.2: Improve water quality and reduce annual flood damage by restoring floodplain hydrology on newly acquired lands where agricultural drainage is no longer needed.

Strategy 5.1.3: Promote the enhancement and protection of riparian corridors.

Strategy 5.1.4: Manage for sustainable harvest of recreational fish species.

#### *GOAL 6, RESIDENT WILDLIFE:*

Provide a complex of habitats suitable for a wide range of resident (endemic) wildlife species, including mammalian, avian, amphibian, and reptilian species, while achieving habitat management objectives and biological integrity with other native flora and fauna.

Objective 6.1: Conserve, restore, and manage up to 9,451 acres of refuge lands to support resident wildlife species and population levels identified in the WTWR Conservation Plan.

In keeping with refuge management objectives and establishing purposes, sound biological principles are used in the assessment of, and when feasible, management of resident species. In some resident species' groups, little specifically targeted resource management is performed other than monitoring, and protection and awareness of any species of special concern that may exist on the refuge. However, management for priority habitat conditions often results in good management for a host of resident species. Resident game species lend themselves to active management in the form of hunt management, check station information collection, and biological assessment of harvested individuals. Targeted management efforts directed at resident species focus on maintaining viable populations, rather than favoring certain species, age classes, or sexes.

Strategy 6.1.1: Manage resident wildlife populations to achieve habitat management objectives and biological integrity with other priority species and species' groups.

#### *GOAL 7, PUBLIC USE:*

Enhance public use of the refuge through development of an appropriate and compatible program of wildlife-dependent recreation and education/interpretation that is consistent with the National Wildlife Refuge System Improvement Act of 1997, benefiting visitors and promoting an understanding of the Lower Mississippi River Valley ecosystem.

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The National Wildlife Refuge System Improvement Act of 1997 identifies six priority wildlife-dependent public use activities for national wildlife refuges: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. Fundamental to the provision of these uses are viable and diverse fish and wildlife populations and the habitats upon which they depend. These priority uses, along with all other proposed uses, must be compatible with the refuge's establishing purposes and the mission of the National Wildlife Refuge System, and will receive enhanced consideration over other general public uses.

If determined appropriate, recreation fees and concessions are tools available to assist in managing these uses. The refuge will only permit other uses when determined that they are legally mandated, provide benefits to the Service, occur due to special circumstances, or facilitate one of the priority wildlife-dependent recreational uses. See 605 FW 1, General Guidance, and 603 FW1, Appropriate Refuge Uses.

Objective 7.1: Manage up to 9,451 acres of refuge lands to provide compatible opportunities for wildlife-dependent public use activities, including the six designated as priority for national wildlife refuges: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

Strategy 7.1.1: Provide appropriate and compatible fishing opportunities at Lower Hatchie Refuge, consistent with sound biological principles, by maintaining existing access and facilities, and by evaluating refuge resources for possible additional fishing opportunities.

Strategy 7.1.2: Provide appropriate and compatible hunting opportunities at Lower Hatchie Refuge by maintaining existing access and facilities and by evaluating refuge resources for possible additional hunting opportunities and access.

Strategy 7.1.3: Provide quality, appropriate, and compatible wildlife observation and photography opportunities at Lower Hatchie Refuge by maintaining existing access and facilities and by evaluating refuge resources for additional opportunities and facilities.

Strategy 7.1.4: Provide quality, appropriate, and compatible environmental education and interpretation programs at Lower Hatchie Refuge by maintaining existing programs and facilities and by evaluating opportunities for additional programs and resources.

Strategy 7.1.5: Develop an effective program of public outreach and awareness that provides an understanding and appreciation of the refuge and the Lower Mississippi River Ecosystem, the refuge's ecology, and the human influence on ecosystems of west Tennessee.

Strategy 7.1.6: Examine existing methods of orienting visitors to the refuge, and develop more effective methods and facilities to accomplish information dissemination and visitor orientation.

Strategy 7.1.7: Evaluate and improve existing partnerships, and pursue opportunities for support groups and other partnerships, including a refuge volunteer program.

#### *GOAL 8, ADMINISTRATION AND OPERATION:*

Ensure that present and future operational, administrative, and personnel objectives are achieved in order that goals and objectives for refuge habitats, fish and wildlife populations, land conservation, and visitor services will be achieved.

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Discussion: The administrative and operational functions associated with a refuge include a wide array of activities that are critical to the mission of the Refuge System and the purpose of each refuge. These functions include staffing, training, budgeting, planning, access, law enforcement, facilities management, community relations, partnering, and maintenance. Refuges must have appropriate staff, facilities, equipment, and funding in order to accomplish their overall goals and objectives.

Office space is needed at Lower Hatchie Refuge for one existing operations specialist and two equipment operators, as well as for seven additional proposed positions (equipment operator, refuge manager, maintenance worker, operations specialist, office assistant, public use specialist, and full-time law enforcement officer) and at least one extra space for other occasional refuge workers (e.g., complex forester, interns, or volunteers). The current office is located in a single-wide trailer with limited office space available for only two people. Existing maintenance facilities include one storage shed, one safety storage shed for hazardous materials, two pole sheds, and a maintenance shop.

Objective 8.1: Provide adequate facilities, personnel, training, and equipment necessary to accomplish a comprehensive management program, as proposed in this plan, by 2009.

Strategy 8.1.1: Develop appropriate maintenance facilities and a small office/visitor center to ensure safe and efficient operations, by 2007.

Strategy 8.1.2: Develop staff resources, including personnel, equipment, and training, adequate to accomplish a comprehensive management program, as proposed in this plan.

Strategy 8.1.3: Maintain highly trained and effective law enforcement personnel to ensure trust resource protection, visitor safety, and enforcement of all refuge-related acts and regulations.

#### *GOAL 9, LAND PROTECTION AND CONSERVATION:*

Conserve natural and cultural resources through partnerships, protection, and land acquisition.

To further conserve and protect natural and cultural resources on and in the vicinity of the refuge, staff would seek to develop and enhance partnerships with State and county natural resource agencies, conservation organizations, and neighboring landowners. Among critical issues to be addressed are water quality, erosion and sedimentation, and cultural resource protection. With the enactment of the Antiquities Act of 1906, the Federal Government recognized the importance of cultural resources to the national identity and sought to protect archaeological sites and historic structures on those lands owned, managed, or controlled by the United States. The Service would work toward improving resource protection through offering technical advice, evaluating potential land acquisition opportunities from willing sellers, and identifying and protecting cultural and historic resources on refuge lands. See further discussion of cultural resource protection in Section B of this Draft CCP.

Objective 9.1: Through land acquisitions from willing sellers, technical assistance with private landowners, and protection of cultural resources, protect the remaining 13,778 acres within the approved acquisition boundary, as well as neighboring lands which have potential to significantly impact refuge natural and cultural resources.

Strategy 9.1.1: By 2008, work with the realty specialist to update, address, and contact lists for all inholders and make inquiries concerning their willingness to sell identified properties.

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Strategy 9.1.2: Work with partnering conservation organizations such as The Nature Conservancy, The Conservation Fund, The Trust for Public Lands, and others to acquire land for the refuge.

Strategy 9.1.3: Acquire the remainder of the 13,778-acre approved acquisition boundary as funding and willing sellers are available.

Strategy 9.1.4: Work with private landowners through the Partners for Wildlife program to improve wildlife habitat and reduce sedimentation and contaminant problems that affect the refuge.

Strategy 9.1.5: Protect cultural and historic resources from disturbance or inadvertent damage that could occur as a result of refuge activities.

Strategy 9.1.6: By 2008, assess the feasibility of conducting a refuge-wide archaeological survey.

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## *V. Plan Implementation*

### **BACKGROUND**

Refuge lands are managed in accordance with the National Wildlife Refuge System Improvement Act of 1997, the Fish and Wildlife Manual, sound biological principles, and current research. Congress has distinguished a clear legislative mission of wildlife conservation for all national wildlife refuges, which, unlike other public lands, are dedicated primarily to the conservation of the Nation's fish and wildlife resources. Recreational values are accommodated where they are appropriate and compatible with the congressional mandate for protecting wildlife first. Priority projects emphasize the protection and enhancement of fish and wildlife species first and foremost, but consideration is given to balancing the needs and demands for recreation and environmental education.

To accomplish the purpose, vision, goals, and objectives contained in this plan for Lower Hatchie Refuge, this section identifies proposed projects, a cost summary for those proposed projects, staffing and funding needs, step-down management plans, partnership opportunities, a monitoring and evaluation plan, and a plan for review and revision of the plan.

### **PROPOSED PROJECTS**

The following proposed projects describe the basic needs that have been identified by Service staff, the public, and planning team members for the management of fish and wildlife populations, habitats, visitor services and environmental education, refuge administration and operation, and land protection and conservation on the refuge over the next 15 years.

For the purposes of achieving the goals and objectives developed for the refuge, the plan has grouped management strategies into specific projects. This plan describes 13 potential projects for development and management. Some of these projects include several different components, such as pieces of heavy construction equipment or staff positions, which would be needed to accomplish a particular project. Private lands have also been identified for potential acquisition from willing sellers or possible enrollment in conservation programs offered by the Service or other partnering agencies.

A cost summary of projects proposed is provided in Table 1. These figures would be specifically updated and adjusted annually. There are no estimates of potential land purchases, because land values vary according to the time of the sale and market value at the time of purchase. There are no assurances that these projects will be either fully or partially funded. However, with the help and cooperation of conservation partners, the Service would use this plan to focus attention on funding the management, operation, and maintenance needs of the refuge.

The following proposed projects are categorized under four management categories: Fish and Wildlife Populations and Habitat Management, Visitor Services and Environmental Education, Refuge Administration and Operation, and Land Protection and Conservation. Each project description includes first-year costs, recurring annual costs (if any), and linkages of the proposed project to the specific goals and objectives developed during the course of the CCP planning process.

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## PROJECT DESCRIPTIONS

### **Project Category 1: Fish and Wildlife Populations and Habitat Management**

#### Project 1: Wildlife Biologist Position for Research, Monitoring, Inventorying - 1 full-time equivalent (FTE)

Needed biological studies include conducting bald eagle counts, spring and fall shorebird counts, winter waterfowl surveys, and breeding bird surveys. The project also includes work with nest box programs and special concern species in the west Tennessee area. This project would also monitor moist-soil impoundments to assess conditions, the viability of important wildlife species, existing and potential threats to each area, and whether each is being managed properly to benefit wildlife. This project would enhance public recreation and benefit waterfowl, shorebirds, endangered species, and resident wildlife. A full-time biologist is needed to perform the ongoing surveys and censuses associated with monitoring. The estimated first-year cost is \$139,000, with a recurring annual cost of \$74,000. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, and 6.1)

#### Project 2: Fire Management

The new Native Warm Season Grasses Restoration project would require regular prescribed burns. Prior to this project, prescribed burns were not used on the complex. Therefore, equipment is needed to restore this critical ecosystem function, which benefits myriad wildlife species.

Project 2A: Fire Plow/Harrow, Truck, Protection Equipment, and Hand Tools. Needed equipment includes a fire plow/harrow and truck. Also, personal protection equipment and hand tools are required. The estimated first-year cost of this project is \$75,000, with a recurring annual cost of \$5,000. (Linkages: Objectives 3.1, 6.1.)

Project 2B: Slip-On Fire Pumper. A 20-year-old fire pumper is used in battling wildfires throughout the complex. It is the first line of defense used by station personnel to protect 30,000 acres of habitat and facilities on two national wildlife refuges. These lands and facilities are crucial for the public use programs on the refuges and their loss to fire would affect more than 200,000 annual visitors to the two refuges. Additionally, the manufacturer of the current pumper is no longer in business and parts are no longer available. Breakdowns are frequent and having parts fabricated is costly. The estimated first-year cost of this project is \$8,000, with no recurring annual cost. (Linkages: Objective 3.1, 6.1.)

#### Project 3: Moist-Soil Management

Man-made hydrological alterations have all but eliminated the natural flooding regimes that once supported historical numbers of waterfowl and shorebirds in the MAV. Lower Hatchie Refuge is located in one of the few remaining unleveed portions of the Mississippi River floodplain, so much of the refuge is inundated annually by the Mississippi and Hatchie Rivers' seasonal flooding. However, a system of levees, water control structures, and wells is necessary to provide dependable flooded habitats to correspond with the migration chronologies of migratory birds. The timing of water management is critical not only to meet the needs of migratory birds, but also to stimulate the production of desirable moist-soil plants and control undesirable plants. An approximately 1,256-acre moist-soil and agricultural impoundment system at the refuge is in need of funding for additional resources and equipment for proper restoration, management, and operation, as well as expansion of the system. This system is used by 100,000 wintering waterfowl and shorebirds annually. Numerous wetland-dependent species would be benefited by this project. The improved impoundments would also provide additional feeding habitat for the bald eagle population that migrates through or spends the winter on the refuge. This activity also benefits resident wildlife, and would increase public education for the approximately 80,000 annual visitors to the refuge and the Sunk Lake Public Use Natural Area.

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The refuge has 1,256 acres of moist-soil/agricultural field impoundments, including 481 acres that can be flooded for waterfowl. Inundation of the impoundments is incomplete and mostly dependent upon rainfall. To expand and enhance the waterfowl sanctuary, the refuge staff would be developing 100 acres of shorebird habitat and 481 acres of waterfowl habitat in the sanctuary. The project entails the installation of 21 water control structures, construction of 2.1 miles of levees, installation of a water well, and procurement of a water pumping system. Levees would be seeded and graveled. A well would provide a reliable water source to move water through the impoundment system. These improvements to the impoundment system are expected to increase the number of waterfowl and shorebirds using the system by 50 percent and 100 percent, respectively.

Project 3A: Rehabilitation of 310 Acres of Existing Moist-Soil Habitat. The refuge currently has 6 moist-soil impoundments (310 acres total), which are seriously degraded due to encroachment by undesirable plant species. To reclaim the existing impoundments and maintain the planned expansion of moist-soil impoundments, this project would require a 150-horsepower tractor, grain drill, and disk. The estimated first-year cost of this project is \$154,000, with a recurring annual cost of \$4,000. (Linkages: Objectives 1.1, 4.1.)

Project 3B: Installation of a Water Well and a Water Pumping System. A well is needed to provide a reliable water source to move water through the impoundment system. This project would include the installation of a water well and the procurement of a water pumping system. The estimated first-year cost of this project is \$285,000, with a recurring annual cost of \$10,000. (Linkages: Objectives 1.1, 4.1.)

Project 3C: Replace Dump Truck. This project calls for the replacement of the 1976 dump truck, which is needed for construction, maintenance, and renovation projects. Projects include moist-soil impoundment rehabilitation and construction to benefit more than 100,000 migrating and wintering waterfowl and shorebirds annually. Additionally, this dump truck is used for road maintenance and repair projects in an effort to ensure safe access for more than 80,000 visitors annually. Due to many years of hard service, safety concerns, and frequent repair, the truck must be replaced. The estimated first-year cost is \$106,000, with no recurring annual cost. (Linkages: Objectives 1.1, 4.1, 7.1.)

Project 3D: Replace Ford Tractor and Boom Axe. This project calls for the replacement of the 1978 Ford 6600 farm tractor and boom axe, which is essential for maintenance activities on more than 500 acres of moist-soil habitat, and more than 10 miles of public use roads on the refuge. The tractor is being used to set back succession and control exotic and invasive species on the refuge's moist-soil impoundments, which provide natural food sources and habitats for more than 100,000 migrating and wintering waterfowl and shorebirds annually. Additionally, the tractor is essential in maintaining roadside vegetation to ensure safe access for more than 80,000 visitors annually. The estimated first-year cost is \$91,000, with no recurring annual cost. (Linkages: Objectives 1.1, 4.1, 7.1.)

Project 4: Wetland Restoration.

With the approved refuge expansion of 13,778 additional acres, the refuge is in need of restoration of over 4,000 acres of wetlands, including the restoration of hydrology, as well as reforesting large tracts of wetlands to bottomland hardwoods. As many as 500 acres of new moist-soil areas would be designed and developed. Hunting and fishing opportunities would increase by an estimated 50 percent and wildlife viewing and other wildlife-compatible recreation would also increase significantly.

Project 4A: Reforestation of Wetlands. Refuge personnel would be conducting reforestation of wetlands (i.e., seedling and acorn planting), timber stand improvement, and beaver control to support station restoration objectives. Pre-refuge forest management had been a practice of high-grading, resulting in poor habitat for all wildlife species. Approximately 40 acres would be restored annually,

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with the goal of creating a species composition favoring red oak. The estimated first-year cost of this project is \$14,000, with a recurring annual cost of \$1,000. (Linkages: Objectives 1.1, 3.1)

Project 4B: Refuge Manager Position (1 FTE). To accommodate the expanded and new administrative and recreational opportunities, as well as to provide proper management and direction for refuge programs, a new refuge manager is needed. The estimated first-year cost of this project is \$139,000, with a recurring annual cost of \$74,000. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1.)

Project 4C: Maintenance Position (1 FTE). A maintenance person is needed to assist the complex forester in conducting timber stand improvement projects on the refuge and to assist in reforestation programs on the refuge. The estimated first-year cost of this project is \$119,000, with a recurring annual cost of \$54,000. (Linkages: Objectives 1.1, 3.1)

Project 4D: Refuge Operation Specialist (1 FTE). The approved expansion of Lower Hatchie Refuge would result in an additional 4,000 acres of forest to be managed, 100 acres of new moist-soil areas to be developed, and approximately 1,800 acres of wetlands to be reforested. This expansion would result in greatly increased management responsibilities, as well as opportunities for expanded programs in environmental education, interpretation, and wildlife-dependent recreation. A new operations specialist would be needed to accomplish this significantly greater workload. The estimated first-year cost is \$98,000, with a recurring annual cost of \$48,000. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1.)

Project 5: Forest Habitat Restoration and Management. Prior to European settlement, the LMRV contained more than 24 million acres of bottomland hardwood forests that supported a wide variety of wildlife species. Today, over 80 percent of the original forest has been lost to land clearing for agriculture, transportation, industrialization, and urbanization. The remaining 4.8 million acres of bottomland hardwoods lie in numerous isolated "habitat islands" that are often surrounded by a sea of agriculture. Lower Hatchie Refuge is part of a forest complex that comprises one of the largest remaining contiguous blocks of bottomland hardwood forest in the State. In addition, pre-refuge land management resulted in high-grading of marketable timber, resulting in poor habitat for all wildlife species. Reforestation of selected refuge open lands and other non-forested lands surrounding the refuge would contribute to regional and national objectives for forest-dwelling birds, as well as numerous resident species. Reforested areas would be monitored to determine seedling survival and growth. The complex would be conducting reforestation of wetlands (i.e., seedling and acorn planting), timber stand improvement, and beaver control to support the West Tennessee National Wildlife Refuge Complex objectives, as well as regional and national objectives. The forested habitat on the four refuges in the complex is managed to meet the needs of the 820,000 waterfowl, other migratory birds, and resident wildlife, as well as the 715,000 visitors who use the refuges in the complex annually.

Project 5A: Reforestation and Timber Stand Improvement. With this project, approximately 700 acres would be restored annually with the goal of restoring a strong (60 percent basal area target) red oak component in the refuge forests. The project would include timber stand improvements on over 10,000 acres within the complex. With recent boundary expansions, an additional 20,000 acres of wetlands could be reforested over the next 10 years. This is a joint project between Lower Hatchie and Chickasaw Refuges. The estimated initial cost of this project is \$138,000, with a recurring cost of \$128,000 per year, to be shared between the two refuges. (Linkages: Objectives 1.1, 3.1.)

Project 5B: Forester Position (1 FTE). A forest habitat inventory is necessary for the effective management of the refuge's 9,451 acres, as well as additional lands, which may be acquired from the additional 13,988 acres contained within the approved acquisition boundary. This project calls for a comprehensive forest inventory and would require an additional forester position, vehicle, and ATV.

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In addition, aerial photos, a computer, and related software are needed to acquire, analyze, and maintain the data. This information is indispensable in the preparation and maintenance of the draft Habitat Management Plan. This position would also support forest management efforts on nearby Chickasaw Refuge. The estimated first-year cost is \$118,000, with a recurring annual cost of \$53,000. (Linkages: Objectives 1.1, 3.1.)

Project 5C: Tree Planter. The tree planter is used extensively to reforest newly acquired tracts of land throughout the complex and on private lands. The complex has a progressive land acquisition program (from willing sellers) and is acquiring land annually. The refuge could be reforesting between 500 and 1,000 acres of bottomland hardwood forest annually. In addition, the Partners for Wildlife Program allows the Service to reforest privately owned land. The complex could be reforesting approximately 200 acres of private land annually. Due to rough planting conditions and age, the planter has become worn and is in need of replacement. The estimated first-year cost of this project is \$8,000, with no recurring annual cost. (Linkages: Objectives 1.1, 3.1.)

Project 6: Farming of 200 Additional Acres as Moist Soil Habitat. Approximately 200 additional acres of moist-soil habitat would be farmed by force account as a result of this project. Equipment purchased would support various other projects throughout the complex. Farming would allow the moist-soil units to remain in an early successional stage. Farming also helps control invasive plants, such as cocklebur and hemp sesbania. The 9,451-acre Lower Hatchie Refuge, which represents part of the largest contiguous tract of bottomland hardwood forest in the State of Tennessee, is located within 40 miles of one million people. This project would greatly increase wildlife viewing and other wildlife-oriented recreational opportunities. This activity benefits migratory birds, endangered species, and resident wildlife.

Project 6A: 200-Horsepower Tractor, Grain Drill, and Cyclone Seeder. This project calls for initiating farming activities on 200 additional acres to improve degraded wildlife habitats on the refuge. Farming activities to be conducted include the stabilization of 50,000 linear feet of new levees as they are built, through the purchase of a cyclone seeder, grain drill, and a 200-horsepower tractor. The estimated first-year cost is \$77,500, with no recurring annual cost. (Linkages: Objectives 1.1, 4.1.)

Project 6B: Replace Military Dump Truck. This project calls for the replacement of the 1972 military dump truck, which is needed for levee construction and stabilization associated with moist-soil habitat development. This truck would also be used for other construction, maintenance, and renovation projects, including road maintenance and repair projects, which ensure access for more than 80,000 visitors annually. This project would benefit more than 100,000 migrating and wintering waterfowl and shorebirds annually. This truck lacks safety equipment and needs frequent repairs due to carburetor, brake, clutch, and electrical failures. The estimated first-year cost is \$110,000 with no recurring annual cost. (Linkages: Objectives: 1.1, 4.1, 7.1.)

Project 7: Nuisance Plant Control. There are three main noxious and/or invasive plants that occur on the complex: a hybrid cocklebur, hemp sesbania, and kudzu. All three are fast-growing and all out-compete native vegetation, in some cases killing the native species. This area has become home to a hybrid cocklebur that is resistant to flooding and wet-soil conditions. The species is prolific and will out-compete native moist-soil vegetation. Hemp sesbania also invades the moist-soil units and will out-compete the moist-soil vegetation. Kudzu resides in the upland habitat and is common along refuge boundaries and drainages. Kudzu can grow up to 60 feet per year and will eventually out-compete all native vegetation. It will even cover trees, denying the tree of sunlight.

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Project 7A: Eradicate Invasive Plants Through Chemical and Mechanical Means. This project calls for control of approximately 200 acres of moist-soil units through chemical treatment and mechanical means. Fifteen acres of kudzu would be treated with chemicals. This is a complex-wide project. The estimated first-year cost is \$49,000, with a recurring annual cost of \$15,000 per year, to be shared among four refuges. (Linkages: Objectives 1.1, 3.1.)

## **Project Category 2: Visitor Services and Environmental Education**

Project 8: Rehabilitation of Roads, Boat Ramps, and Parking Areas. Poor access roads severely hamper public opportunities to visit and enjoy the refuge. As many as 80,000 annual visitors come to the refuge to view over 200 species of birds, including more than 100,000 migrating ducks, geese, and shorebirds. Currently, several refuge roads, boat ramps, and parking areas are in poor condition as a result of Mississippi River flood waters. These roads have little gravel, and poor drainage makes them impassable at times to all but four-wheel-drive vehicles during wet weather. This project would reconstruct these roads to minimum public use standards by raising the road beds, adding drainage culverts, and surfacing with gravel.

Project 8A: Repair Fort Prudhomme Road. The Fort Prudhomme Road, which serves as the refuge entrance road, has become severely eroded and rutted by floods and extensive public use. The road serves as the only access point to the refuge headquarters and the Mississippi River for many of the 80,000 annual visitors. This road is also vital for staff performing resource protection and habitat management activities. This project would replace existing culverts, and would repair, reshape, and resurface the existing 1.38-mile-long road. The project would eliminate current road deficiencies and help prevent future impacts from river flooding. The estimated first-year cost is \$857,000, with no recurring annual cost. Funding for road construction would be available from the TEA-21 Refuge Roads Fund. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1.)

Project 8B: Repair Champion Lake Road and Parking Area. The Champion Lake Road (Route 101 - Section 1) provides year-round access to the Champion Lake area of the refuge. This road is also vital for staff performing resource protection and habitat management activities. This project would replace existing culverts and would repair, reshape, and resurface the existing 0.54-mile-long road and reshape and gravel the parking area at Champion Lake. The project would eliminate current road deficiencies and help prevent future impacts from river flooding. The estimated first-year cost is \$488,000, with no recurring annual cost. Funding for road construction would be available from the TEA-21 Refuge Roads Fund. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1.)

Project 8C: Repair Shankle Lake Road and Trail. The Shankle Lake Road (Route 102 - Section 1) provides year-round access to the Shankle Lake and Hatchie River area of the refuge and is one of the primary access points into the southern portion of the refuge for many of the 80,000 annual visitors. This road is also vital for refuge staff performing resource protection and habitat management activities. This project would replace existing culverts and would repair, reshape, and resurface the existing 1.3-mile-long road. The project would eliminate current road deficiencies and help prevent future impacts from river flooding. The estimated first-year cost is \$435,000, with no recurring annual cost. Funding for road construction would be available from the TEA-21 Refuge Roads Fund (\$145,000), as well as refuge deferred maintenance funding (\$290,000). (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1.)

Project 8D: Repair Mississippi River Road and Parking Area. The Mississippi River Road (Route 100 - Section 1) serves as the only access point to the Mississippi River for many of the 80,000 annual visitors. This road is also vital for staff performing resource protection and habitat management activities. This project would replace existing culverts, and would repair, reshape, and resurface the

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existing 0.53-mile-long road and reshape and gravel the parking area. The project would eliminate current road deficiencies and help prevent future impacts from river flooding. The estimated first-year cost is \$331,000, with no recurring annual cost. Funding for road construction would be available from the TEA-21 Refuge Roads Fund. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1.)

Project 8E: Repair Rorie Lane. Rorie Lane (Route 104 - Section 1) provides access to the Hatchie River Towhead area of the refuge and serves as the only access point to this portion of the refuge for many of the 80,000 annual visitors. This road is also vital for staff performing resource protection and habitat management activities. This project would replace existing culverts and would repair, reshape, and resurface the existing 1.2-mile-long road. The project would eliminate current road deficiencies and help prevent future impacts from river flooding. The estimated first-year cost is \$254,000, with no recurring annual cost. Funding for road construction would be required from the TEA-21 Refuge Roads Fund (\$130,000), as well as refuge deferred maintenance funding (\$124,000). (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1.)

Project 8F: Repair Burlison Road and Parking Areas. The Burlison Road (Route 103 - Section 1) and associated parking areas (Routes 904, 905, and 906) provide year-round access to the Hatchie River on the southern portion of the refuge and serve as the only access point to the Hatchie River boat ramp, which is used by many of the 80,000 annual visitors to the refuge. This road is also vital for staff performing resource protection and habitat management activities. This project would replace existing culverts and would repair, reshape, and resurface the existing 0.06-mile-long road. The project would eliminate current road deficiencies and help prevent future impacts from river flooding. The estimated first-year cost is \$203,000, with no recurring annual cost. Funding for road construction would be available from the TEA-21 Refuge Roads Fund. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1.)

Project 9: Provide Increased Visitor Services at Lower Hatchie NWR. The refuge has more than 80,000 visits per year, a visitor contact station, and hunting and fishing programs. Improvements are needed to basic public use facilities, and additional interpretation, resource protection, and visitor services are needed to meet public expectations. Visitor information and safety would also be enhanced.

Project 9A: Public Use Specialist Position (1 FTE). An improved public use and education program is needed at this frequently visited refuge. This project calls for a public use specialist position, which would result in an improved public use program, and would involve local schools and community groups, thus enhancing community outreach and the volunteer program. The estimated first-year cost is \$130,000 with a recurring annual cost of \$74,000. (Linkages: Objectives 7.1.)

Project 9B: Part-Time Office Assistant (½ FTE). With expanding recreational opportunities and land acquisition, the administrative workload has become overwhelming. With increasing visitation and public use opportunities, the refuge needs a part-time office assistant to handle the day-to-day administrative workload. The estimated first-year cost is \$94,000, with a recurring annual cost of \$29,000. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1.)

Project 10: Construct Refuge Office/Visitor Center. This project calls for the construction of an office/small visitor center at the refuge. Staff assigned to the 9,451-acre refuge have an office located in a trailer (excess from FEMA) that is small and does not provide staff the opportunity to fully develop or meet goals and objectives and support the 80,000 annual visitors. This project would help strengthen partnerships and outreach to visitors, local communities, school districts, and universities, as well as allow the refuge to meet its environmental education goals. With one million people within a 1-hour drive of the refuge and the refuge actively acquiring lands, there is a great need for offices and a visitor contact station that would allow staff to effectively administer activities, as well as meet

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the needs of visitors. The estimated first-year cost is \$1,010,000, with a recurring annual cost of \$15,000. (Linkages: Objectives 7.1, 8.1.)

### **Project Category 3: Refuge Administration and Operation**

Project 11: Maintenance Equipment Replacement. It is essential that the maintenance equipment remain in proper working condition for the effective management of the 1,256 acres of moist-soil/agricultural habitat and 5,074 acres of bottomland hardwood forest habitat. This equipment is used for habitat projects, which benefit more than 100,000 migrating and wintering waterfowl and shorebirds annually and provide recreational opportunities for more than 80,000 annual visitors.

Project 11A: Replace 4X4 Maintenance Truck. This project calls for the replacement of the 8-year-old 4X4 maintenance truck, which is essential to providing support to the refuge's habitat renovation, enhancement, and management activities. This truck is used extensively off road on remote and often rough portions of the refuge to provide maintenance and service support for heavy equipment operations. Due to the nature of use, this vehicle has experienced excessive wear and has become unreliable. The estimated first-year cost is \$25,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1.)

Project 11B: Replace 4X4 Maintenance Truck. This project also calls for the replacement of the 4-year-old Chevrolet 4X4 truck, which is essential to providing support to the refuge's habitat renovation, enhancement, and management activities. This truck is used extensively off road on remote and often rough portions of the refuge to provide maintenance and service support for heavy equipment operations, as well as for law enforcement operations. Due to the nature of use, this vehicle has experienced excessive wear and has become unreliable. The estimated first-year cost is \$30,000, with no recurring annual cost. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 8.1.)

### **Project Category 4: Land Protection and Conservation**

Project 12: Landscape Conservation Planning. National, regional, and State conservation objectives for waterfowl, shorebirds, and forest-breeding birds are being stepped down to guide the formulation of objectives for the refuge focus area. Hence, there is a need to integrate science-based monitoring and inventory data with restoration and habitat management efforts on the refuge and surrounding landscape. In west Tennessee, the planning effort would cover five refuges and is being expanded to include State and private lands, which provide habitat for migratory birds. In the MAV, migratory bird habitat requirements have been developed. This information is being expanded to include areas in west Tennessee outside the MAV. Given these recommendations, it is clear that ample habitat cannot be provided on national wildlife refuges alone. Therefore, if we are to achieve the habitat goals that have been established, we must look beyond the respective refuge boundaries and incorporate into the CCP any public or private lands that may be available. The primary objective of this plan is to provide a means of cooperatively protecting, restoring, and managing a sufficient amount and diversity of habitat to meet the requirements of migratory birds and resident wildlife that use west Tennessee habitats. This project calls for the comprehensive conservation planning effort to be completed by 2006. This is a complex-wide project. The estimated first-year cost is \$105,000, with a recurring annual cost of \$100,000, to be shared among the four refuges in the complex. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1.)

Project 13: Law Enforcement. Increased law enforcement activities over the 30,000+ acres on the southern half of the West Tennessee National Wildlife Refuge Complex are needed to properly protect wildlife, habitats, and increasing numbers of visitors. Approximately 1 million people currently live within 50 miles of the refuges, and expansion of recreational uses has overwhelmed present

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staff, with known violations going unenforced. Improved visitor safety and wildlife protection would be made possible by this project. As many as a half-million ducks and numerous other wildlife species, including a growing population of bald eagles, depend on the refuges' habitat, some of the largest protected areas in the State of Tennessee.

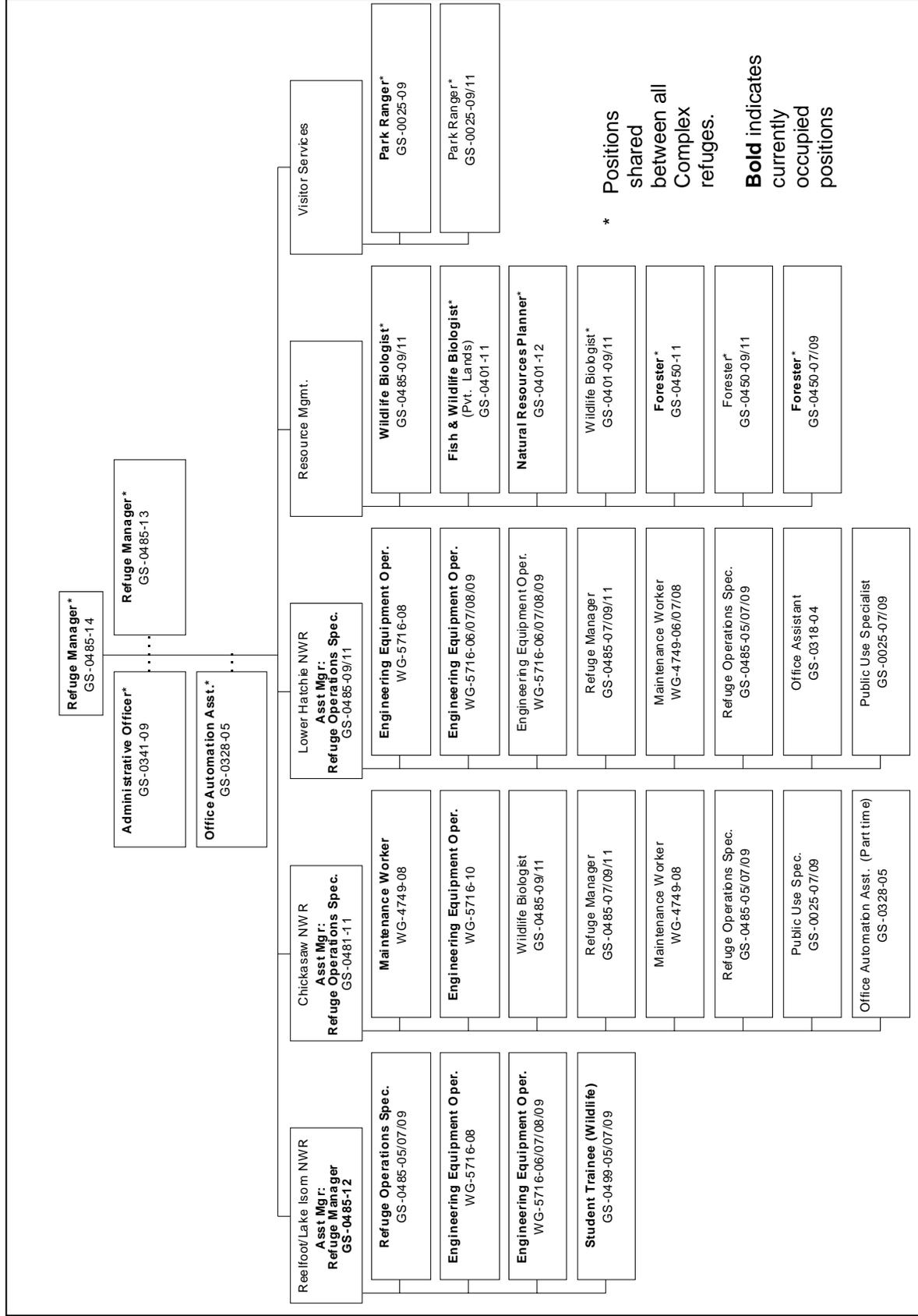
Project 13A: Replace Radio System. This project calls for replacement of the current low-band radio system to meet the new Service guidelines. The current radio system is inadequate and unreliable. The new high-band system would increase management efficiency over a 70-mile radius. The system would allow law enforcement personnel to be in continual contact with other law enforcement agencies and would also give other agencies the ability to contact Service personnel. This system would prove very beneficial in search-and-rescue operations. This is a complex-wide project. The estimated first-year cost is \$255,000, with a recurring annual cost of \$5,000, to be shared among the four refuges in the complex. (Linkages: Objectives 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1)

Project 13B: Full-time Law Enforcement (LE) Position (1 FTE) and LE Equipment. The LE program would be improved in safety and efficiency through the purchase of equipment, including a safe, a shotgun, a vehicle, three public address-siren-director-strobe systems, and three mobile radios. This activity would benefit migratory birds, endangered species, and resident wildlife and promote safer wildlife-dependent recreation. A full-time LE officer would be required for this activity. This is a complex-wide project. The total cost is \$129,000, with a recurring annual cost of \$65,000, to be shared among the four refuges in the Complex. (Linkages: Objectives 1.1, 2.1, 6.1, 7.1, 8.1.)

## **STAFFING AND FUNDING**

Currently a staff of three permanent positions has been approved for the Complex. To complete the extensive wildlife habitat management and restoration projects and conduct the necessary inventorying, monitoring, and mapping activities, more staff are needed. Figure 10 shows the proposed staffing plan for Lower Hatchie Refuge and the West Tennessee National Wildlife Refuge Complex. The proposed staffing increases would enable the refuge to achieve its plan objectives and strategies within the next 15 years. The initial project costs (including salaries and benefits) would total \$6.3 million, with annual recurring costs of \$0.7 million (Table 1). The rate at which this refuge realizes its full potential to contribute locally, regionally, and nationally to wildlife conservation and wildlife-dependent recreation and environmental education is contingent upon receiving adequate staffing and funding.

**Figure 10. Proposed Staffing Plan for West Tennessee National Wildlife Refuges Complex**



**Table 1- Cost Summary of Proposed Projects**

Projects	Initial Project Cost *	Recurring Base Cost**
Fish and Wildlife Populations and Habitat Management		
1. Biologist Position (1 FTE)*** for Surveys and Censuses	\$139,000	\$74,000
2. Fire Management		
A. Fire Plow/Harrow, Truck, Tools, Equipment	\$75,000	\$5,000
B. Slip-On Fire Pumper	\$8,000	-----
3. Moist Soil Management		
A. Rehab 310 Existing Acres of Moist Soil Habitat	\$154,000	\$4,000
B. Water Well and Water Pumping System	\$285,000	\$10,000
C. Replace Dump Truck	\$106,000	-----
D. Replace Ford Tractor and Boom Axe	\$91,000	-----
4. Wetland Restoration		
A. Reforestation of Wetlands	\$14,000	\$1,000
B. Refuge Manager Position (1 FTE)***	\$139,000	\$74,000
C. Maintenance Position (1 FTE)***	\$119,000	\$54,000
D. Refuge Operation Specialist (1 FTE)***	\$98,000	\$48,000
5. Forest Habitat Restoration and Management		
A. Reforestation and Timber Stand Improvement	\$138,000	\$128,000
B. Forester Position (1 FTE)***	\$118,000	\$53,000
C. Replace Tree Planter	\$8,000	-----
D. Replace International Bulldozer	\$223,000	-----
6. Farming 200 Additional Moist Soil Acres		
A. 200 Horsepower Tractor, Grain Drill, and Cyclone Seeder	\$77,500	-----
B. Replace Military Dump Truck	\$110,000	-----
7. Nuisance Plant Control		
A. Eradication via Chemical and Mechanical Means	\$49,000	\$15,000
Visitor Services and Environmental Education		
8. Rehab of Roads, Boat Ramps, and Parking Areas		
A. Repair Fort Prudhomme Road	****\$857,000	-----
B. Repair Champion Lake Road and Parking Area	****\$488,000	-----
C. Repair Shankle Lake Road and Trail	****\$435,000	-----
D. Repair Mississippi River Road and Parking Area	****\$331,000	-----
E. Repair Rorie Lane Road	****\$254,000	-----
F. Repair Burlison Road and Parking Areas	****\$203,000	-----
9. Increase Visitor Services at Lower Hatchie NWR		

Projects	Initial Project Cost *	Recurring Base Cost**
A. Public Use Specialist Position (1 FTE)***	\$130,000	\$74,000
B. Part-time Office Assistant (½ FTE)***	\$94,000	\$29,000
10. New Refuge Office/Visitor Center	\$1,010,000	\$15,000
Refuge Administration and Operation		
11. Maintenance Equipment Replacement		
A. Replace 4X4 Maintenance Truck	\$25,000	-----
B. Replace 4X4 Maintenance Truck	\$30,000	-----
Land Protection and Conservation		
12. Comprehensive Conservation Planning	\$105,000	\$100,000
13. Law Enforcement		
A. Replace Radio System	\$255,000	\$5,000
B. Full-time LE Position (1 FTE)*** and Equipment	\$129,000	\$65,000
<b>Grand Total</b>	<b>\$6,297,500</b>	<b>\$754,000</b>

\* The Initial Project Cost is the projected sum for getting the project started the first year.

\*\* The Recurring Base Cost is the amount that would be incurred each year thereafter to continue the project.

\*\*\* A total of 7.5 new FTE positions are included in the proposed projects under this draft plan.

\*\*\*\* All or part of funds would come from TEA-21 Refuge Roads Funds.

## STEP-DOWN MANAGEMENT PLANS

This CCP is a broad-scale strategic plan that guides the future direction of the refuge. In order for these strategies and projects to be implemented, detailed step-down management plans have been prepared or updated.

Step-down plans are individual and specific plans, which guide the management of particular resources found on the refuge. These step-down plans outline proposed actions, as well as the benefits and potential impacts of the proposed actions. Some step-down plans would be revised as a result of the planning process, while others would be more fully developed to better address refuge management needs. To assist in preparing and implementing the step-down plans, the staff develops partnerships with local agencies and organizations that provide comments and input during the development of the plans.

The Service will prepare step-down plans in accordance with the provisions set forth in the National Environmental Policy Act of 1969, which requires the identification and evaluation of alternatives and public review and involvement prior to their implementation.

The step-down plans, which are currently being prepared or updated for Lower Hatchie Refuge, are listed below:

**Habitat Management Plan (New Plan), Draft completion 2004:** This plan will describe the overall desired future habitat conditions needed to fulfill the refuge's purpose, goals, and objectives. Procedures, techniques, and timetables for achieving desired future conditions will be developed into a comprehensive

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plan for management of refuge habitats. (This plan incorporates components of step-down plans formerly written for: Forest Management, Moist- Soil Management, and Cropland Management.)

**Wildlife Inventory Plan** (Update), Plan completed 2002: This plan describes inventory and monitoring techniques and time frames. Numerous species, including waterfowl, songbirds, neotropical migratory birds, bald eagles, white-tailed deer, wild turkey, amphibians, and other key resident species are inventoried and their population trends are monitored. These data are essential to guide the management of wildlife habitat on the refuge.

**Sport Fishing Plan** (Update), Draft completion 2004: This plan will address specific aspects of the refuge's fishing program. It will define season structures, areas open to fishing, legal methods of fishing, universal accessibility, facilities needed, and refuge-specific regulations.

**Hunt Management Plan** (Update), Draft completion 2004: This plan will address specific aspects of the refuge's hunting program. It will define species to be hunted, season structures, areas open to hunting, legal hunting methods, all-terrain vehicle use, universal accessibility, facilities needed, and refuge-specific hunting regulations.

**Visitor Services and Education Plan** (Update), Plan completed 2002: This plan describes the refuge's wildlife-dependent recreation, environmental education, and interpretation. Specific items or issues that will be addressed include facility needs, access, and partnerships and outreach opportunities. (The Sport Fishing and Hunt Management Plans are referenced in this plan.)

**Sunk Lake Public Use Natural Area Management Plan** (Update), Draft completion 2004: This plan, developed by the Tennessee Department of Environment and Conservation in cooperation with the Service, describes the Sunk Lake Public Use Natural Area and addresses specific aspects of the State's plan for protection and preservation of Sunk Lake.

Step-down plans currently being prepared or updated for the West Tennessee Refuge Complex (including Lower Hatchie, Reelfoot, Lake Isom, and Chickasaw Refuges) include:

**Beaver Control Management Plan** (Update), Draft completion 2004: This plan includes a description of beaver control methods and an explanation of the necessity to control excess beaver populations in order to protect refuge habitats and the species that are dependent upon those habitats.

**Safety/Hazcom/Pollution Prevention Plan** (Update), Plan completed 2001: This plan identifies specific hazards in the workplaces of the West Tennessee Refuge Complex, and defines staff responsibilities and procedures for providing and maintaining a safe work environment. The plan also provides guidance for staff in responding to various types of emergencies and dangerous occurrences.

**Fire Management Plan** (Update), Plan completed 2001: This plan describes the use of prescribed fire on refuges in the Complex, as well as a contingency plan in the case of wildfire activity on or in the vicinity of the Complex. Safety considerations for fire-fighting personnel are also addressed in this plan.

**Law Enforcement Plan** (Update), Draft to be completed 2005: This plan describes the basic framework and policy for law enforcement on refuge lands, and the implementation thereof, in cooperation with other local law enforcement entities.

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## **PARTNERSHIP OPPORTUNITIES**

A major objective of this CCP is to establish or enhance partnerships with local volunteers, landowners, private organizations, and State and Federal natural resource agencies. At regional and State levels, partnerships already exist with organizations such as Tennessee Wildlife Resources Agency, Tennessee Department of Environment and Conservation, Natural Resources Conservation Service, Ducks Unlimited, and the The Nature Conservancy. The Sunk Lake Public Use Natural Area provides an ongoing opportunity to partner with the State of Tennessee in resource protection. In the vicinity of the refuge, other opportunities exist to establish partnerships with elementary and secondary schools, private landowners, and community organizations.

The refuge volunteer program and other partnerships generated will be dependent to a large degree upon the number of staff positions provided to the refuge. As staff and resources are committed, opportunities to expand the volunteer program and develop new partnerships would be enhanced.

## **MONITORING AND EVALUATION**

Adaptive management is a flexible approach to long-term management of resources that is directed over time by the results of ongoing monitoring activities and other acquired information. More specifically, adaptive management is a process by which projects are implemented within a framework of scientifically driven experiments to test the predictions and assumptions outlined within a plan.

In order to apply adaptive management, specific inventory, survey, and monitoring methods would be adopted for the refuge, which best assess the effects of ongoing management. Based on the results of these inventories, surveys, and monitoring efforts, habitat management strategies would be systematically evaluated to determine management effects on wildlife populations. This information is then used to refine management and determine how effectively refuge objectives are being accomplished. Evaluations would include appropriate staff and partner participation. If monitoring and evaluation indicate undesirable effects for target or non-target species and/or communities, then alterations to the management projects would be made. If appropriate, the refuge's CCP would be revised.

Specific monitoring and evaluation activities would be described in the step-down management plans.

## **PLAN REVIEW AND REVISION**

This CCP will be reviewed annually to determine the need for revision. A revision will occur whenever important changes occur or pertinent information becomes available, such as a change in ecological conditions or a major refuge expansion. The final plan will be supported by detailed step-down management plans, which direct on-the-ground management activities designed to accomplish specific strategies in support of the refuge's goals and objectives. Revisions to the CCP and the step-down management plans will be subject to public review and NEPA compliance.

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## SECTION B. DRAFT ENVIRONMENTAL ASSESSMENT

# *I. Background*

### INTRODUCTION

This Environmental Assessment (EA) for Lower Hatchie National Wildlife Refuge was prepared in compliance with the National Environmental Policy Act (NEPA). It discusses the purpose and need for the Comprehensive Conservation Plan (CCP) for the refuge and provides an analysis of the impacts that could be expected from each of the management proposals outlined in the plan. This analysis assists the Fish and Wildlife Service in determining if it will need to prepare an Environmental Impact Statement or a Finding of No Significant Impact for the refuge.

### PURPOSE AND NEED FOR ACTION

The purpose of the proposed plan is to specify a management direction and long-term management guidance for Lower Hatchie Refuge. This management direction will be described in detail through a set of goals, objectives, and strategies in the CCP. Generally, CCPs are revised every 15 years or sooner.

Management of this refuge is now guided by objectives developed in 1980 and implemented by specific step-down management plans. This action is needed to address current management issues, to provide long-term management direction, and to satisfy the legislative mandates of the National Wildlife Refuge System Improvement Act of 1997, which requires the preparation of a CCP for all national wildlife refuges.

The purposes of the refuge were established by Congress through the Migratory Bird Conservation Act of 1929 (16 U.S.C. 715d) for "...use as an inviolate sanctuary or for other management purposes, for migratory birds." The Fish and Wildlife Act of 1956 established additional refuge purposes to be "... for the development, advancement, management, conservation, and protection of fish and wildlife resources" (16 U.S.C. 742f (a) (4)), and "...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition or servitude..." (16 U.S.C. 742 (b) (1)). Later, the Refuge Recreation Act of 1962 (16 U.S.C. 460K-1) identified additional purposes for which the refuge was suitable: "...(1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..."

This EA was prepared using guidelines established under the National Environmental Policy Act of 1969 (the Act). The Act requires the Service to examine the effects of proposed actions on the natural and human environment. In the following sections, four alternatives for refuge management are described, including the environmental consequences of each alternative. Each alternative was designed as a reasonable mix of fish and wildlife habitat prescriptions and wildlife-dependent recreational opportunities, with the preferred alternative recommended based on its environmental consequences and ability to achieve the refuge's establishing purposes.

The CCP ultimately derived from this EA will set the management direction for the refuge for the next 15 years. As stated above, the refuge is currently guided by step-down management plans based on 18-year-old objectives. This Draft EA presents four management alternatives for the future of the refuge. The preferred alternative was tentatively selected based on its ability to meet identified goals. These goals may be considered as the primary need for action. Goals for the refuge were developed

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by the planning team and encompass all aspects of management, including fish and wildlife population management, habitat management, visitor services and environmental education, administration and operation, and land protection and conservation. Each of the four management alternatives described in this EA will, in part, strive to achieve these goals, described as follows:

- **Fish and Wildlife Population Management:** Contribute to the population goals and objectives established in regionally, nationally, and internationally significant and relevant management plans, including the North American Waterfowl Management Plan, Lower Mississippi River Joint Venture Plan, Partners-in-Flight, Shorebird Management Manual, Lower Mississippi River Ecosystem Plan, West Tennessee Wildlife Resources Conservation Plan (WTWR Conservation Plan), and other plans relevant to west Tennessee and the Lower Mississippi River Valley.
- **Habitat Management:** Restore, enhance, and manage the various habitats found on the refuge in order to maintain the natural diversity, abundance, and ecological function of communities characteristic of Lower Mississippi Valley bottomland hardwoods and associated habitat types, with an emphasis on critical habitat needs for wintering waterfowl and other migratory birds.
- **Visitor Services and Environmental Education:** Develop an appropriate and compatible program of wildlife-dependent recreation and education/interpretation that is consistent with the National Wildlife Refuge System Improvement Act of 1997, and that will benefit refuge visitors while promoting an understanding of the Lower Mississippi River Valley ecosystem.
- **Refuge Administration and Operation:** Develop and implement a comprehensive refuge management program to ensure that present and future operational, administrative, and personnel objectives will be achieved.
- **Land Protection and Conservation:** Provide for the protection and management of natural resources, including cultural resources, within or in proximity to the refuge.

## **DECISION FRAMEWORK**

The Fish and Wildlife Service will make two decisions based on this EA: (1) select an alternative and (2) determine if the selected alternative is a major federal action significantly affecting the quality of the human environment, thus requiring preparation of an environmental impact statement. The planning team has recommended Alternative D as the alternative to guide the management direction of the refuge. The CCP was developed for implementation based on this recommendation.

## **PLANNING STUDY AREA**

This EA considers four management alternatives for Lower Hatchie Refuge and Sunk Lake Public Use Natural Area (described below), with consideration also given to lands within the refuge's approved acquisition boundary (Figure 6), as well as other lands immediately adjacent to, and directly affected by, the management of the refuge. This draft plan also takes into account the proposed management actions for the four other west Tennessee refuges (as assessed in parallel CCPs), as well as landscape-level planning objectives developed by an interagency team in the production of the WTWR Conservation Plan (2002).

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Lower Hatchie Refuge currently encompasses 9,465 acres and is located approximately 3 miles southwest of Henning, Tennessee. The refuge has an approved acquisition boundary, which includes an additional 14,122 acres of land, for a potential total of 23,587 acres, along the Hatchie River in Tipton and Lauderdale Counties. At full expansion, the refuge boundary would encompass the bulk of the remaining bottomland hardwood forest on the Hatchie River between U.S. Highway 51 and the Mississippi River.

Sunk Lake Public Use Natural Area was established in 1986 by the Tennessee Department of Environment and Conservation (TDEC). Located in Lauderdale County, approximately 6 miles north of the refuge, this natural area is administered by the Lower Hatchie Refuge through a 10-year lease agreement with TDEC. It encompasses 1,873 acres of land similar to that found in the aquatic and bottomland hardwood forest portions of the refuge. Management of Sunk Lake Public Use Natural Area is performed according to management guidelines developed by the State of Tennessee, in keeping with State-designated public use natural areas.

### **AUTHORITY, LEGAL COMPLIANCE, AND COMPATIBILITY**

The National Wildlife Refuge System includes Federal lands managed primarily to provide habitat for a diversity of fish, wildlife, and plant species. National wildlife refuges are established under many different authorities and funding sources for a variety of purposes. The purposes of this refuge were established by specific legislation and are listed in the previous section.

Additional authority delegated by Congress, Federal regulations, executive orders, and several management plans guides the operation of the refuge. Appendix III contains a list of the key laws, orders, and regulations that provide a framework for the proposed action.

### **SCOPING OF THE ISSUES**

The Service developed this plan while ensuring public involvement in refuge management decisions throughout the plan's development. After the planning team was assembled, the Service contacted and involved a wide array of people.

The planning process began in January 2000, when a Core Group composed of Service employees, representatives from the Tennessee Wildlife Resources Agency (TWRA), and Partners-in-Flight met to discuss the scope of the planning effort and issues that would likely affect the future of the refuge. The team met several times during the year as a cooperative biological review was performed with the State of Tennessee and other partners (See CCP Chapter I, Relationship to State Wildlife Agency). In November 2000, a public scoping meeting was held in which public input was received regarding issues concerning management of the refuge. Public input was also received through focus group meetings, by mailings, by Web page responses, and through personal contacts. See Chapter II of the CCP for more detail on the scoping of issues.

### **ISSUES AND CONCERNS**

An array of issues, concerns, and opportunities was addressed during the planning process. Numerous discussions among citizens, focus group participants, resource specialists, and planning staff brought to light several recurring themes. In general, conservation management themes centered primarily on: public access, public use facilities, hunting and fishing opportunities, waterfowl populations and habitat issues, land acquisition, nonconsumptive recreational opportunities, and refuge information dissemination. Alternatives were formulated to address the following issues raised during internal and public scoping:

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- More public access for hunting, fishing, and nonconsumptive uses, including better roads and trails, more access points into the refuge and the Mississippi and Hatchie Rivers, horseback riding, and ATV use.
  - Development of additional recreational use facilities, including boat ramps, footbridges, and viewing platforms.
  - Improvements to waterfowl management capabilities, including water sources for impoundments, more moist-soil habitat, and cropland management issues.
  - More hunting and fishing opportunities, including turkey, deer, and waterfowl issues.
  - More nonconsumptive recreational opportunities, including environmental education, wildlife observation, and photography.
  - Better maintenance of roads, trails, and drainage ditches, including the Sunk Lake ditch.
  - Further development of cooperative management opportunities, including cooperative management of Sunk Lake natural area.
  - Better information dissemination regarding land acquisitions.

A complete listing and further discussion of these issues and concerns can be found in Chapter II of the CCP.

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## II. Alternatives

### FORMULATION OF ALTERNATIVES

Four management alternatives were developed by the planning team based on issues, concerns, and opportunities presented during the CCP scoping process. Management alternatives describe desired resource conditions and visitor experiences for specific geographic areas or specific resource types, wherever they occur, refuge-wide. The issues that are discussed came from individuals, cooperating agencies, conservation organizations, and refuge staff. A summary of the four alternatives is provided in Table 2.

The four management alternatives were developed with the assumption that the possibility exists for new private resources (e.g., volunteers and grant funds) and modest refuge program and/or staff funding increases. Such increases should be supported by legitimate needs and purposes on the refuge, and would be subject to available funding.

The four management alternatives were developed to address most of the issues, concerns, and opportunities identified during the CCP planning process. Specific impacts of implementing each alternative will be examined in this EA in the following five broad issue categories (each category is followed by the types of questions, which were considered in the development of the four management alternatives):

- **Fish and Wildlife Populations Management:** Can we meet the target waterfowl population objectives established for Lower Hatchie Refuge? Will the proposed management alternative support the establishing purposes of the refuge? Will the proposed management scenario benefit natural biodiversity and protect threatened and endangered species which inhabit the refuge? How do we deal with wildlife populations, such as beaver, which negatively affect vegetation and habitat management capabilities?
- **Habitat Management:** What level of habitat restoration and maintenance is appropriate given funding constraints and desired future conditions? Will the management alternative provide the proper balance of moist soil and cropland to meet habitat needs for target waterfowl populations? Does the forest management plan provide a balanced approach from a standpoint of wildlife management and natural biodiversity? Does the current mix of habitat types meet the needs of all wildlife species utilizing the refuge? How can the Service play a more effective role in the cooperative management of the resources of Sunk Lake Public Use Natural Area? Will land acquisitions continue within the approved acquisition boundary?
- **Visitor Services and Environmental Education:** What is the appropriate level of recreational activities on refuge lands? Does the refuge adequately meet the mandate to provide quality wildlife-dependent recreation? What are appropriate non-wildlife-dependent recreational activities on refuge lands? Will the quality of environmental education, both on-site and through outreach, be improved in the future?
- **Refuge Administration and Operation:** Is available funding being used effectively to accomplish refuge priorities? What other sources of income exist and what can management do to acquire additional funding? What areas of the refuge are in need of additional maintenance? How can enforcement efforts be improved within budget constraints? What additional staff positions would most effectively serve to advance the goals and purposes of the refuge?

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- Land Protection and Conservation: What opportunities exist for new partnerships and how can existing partnerships be improved and expanded? What aspects of surrounding land uses threaten the integrity of ecological processes on the refuge? What can the refuge do to control or reduce negative impacts to cultural and natural resources found on or in the vicinity of the refuge?

## **DESCRIPTION OF ALTERNATIVES**

The following section describes the generalized features for each refuge management alternative. Table 2 describes the features of each alternative according to various issue categories.

### *ALTERNATIVE A: NO ACTION*

Existing refuge management and public outreach practices would be favored under this alternative. The staff would continue to restore and maintain bottomland hardwood forests and moist-soil habitat on existing lands, and no additional moist soil-units would be developed. Existing cropland habitat units would be maintained. New lands would be acquired within the approved acquisition boundary as willing sellers and funds became available.

Control of exotic plants or nuisance wildlife populations, including beaver, would be kept to a reactive level. Seasons and access for hunting and fishing would continue as they currently exist, including the seasonal closure of waterfowl sanctuaries. No new visitor education facilities would be built and only limited improvements would occur for existing environmental education exhibits and interpretive materials.

The current refuge management and programs portion within Chapter III of the CCP contains more detail about the current management of the refuge.

**Table 2: Comparison of Management Alternatives for Lower Hatchie National Wildlife Refuge.**

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Mgmt Emphasis	Alternative D Balanced Public Use And Habitat Mgmt (Proposed Action)
<b>Fish and Wildlife Populations Management</b>				
<i>Threatened and Endangered Species (T&amp;E Species)</i>	Monitoring of bald eagles and interior least terns.	Monitoring of bald eagles and interior least terns. Develop interpretive materials to supplement T&E species management.	Increase closures if needed to eliminate disturbance of bald eagles.	Same as Alts. B and C. combined.
<i>Nuisance Wildlife and Invasive Species Control</i>	Control beaver populations to minimize loss of trust, threatened, and endangered, and resident species. Mechanical and chemical control of noxious and/or invasive plants.	Control beaver populations to minimize loss of trust, threatened, and endangered species. Reactive control only. Public education of nuisance wildlife and invasive species control	Control beaver populations to benefit and increase trust, threatened, endangered, and resident species. Mechanical and chemical control of noxious and/or invasive plants	Same as Alt. A. Increase public awareness of nuisance wildlife and invasive species control.
<i>Neotropical Migratory Songbirds</i>	Continue long-term monitoring of existing populations and habitat.	Increase interpretive and education efforts to promote nongame bird conservation activities while providing public use access.	Develop management plans/guidelines for priority species and manage habitat essential to maintaining viable populations	Develop management plans/guidelines for priority species and manage habitat essential to maintaining viable populations. Increase interpretive and education efforts to promote nongame bird conservation activities.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Mgmt Emphasis	Alternative D Balanced Public Use And Habitat Mgmt (Proposed Action)
<i>Migratory Waterfowl and Shorebirds</i>	Limited access and maximum protection. Manage populations for Mississippi Alluvial Valley (MAV) target goals through habitat management. Seasonal closures of sanctuaries.	Enforce minimum legal protection and reduce closures to public access. Enhance public viewing opportunities.	Enhance water management capability, farming, and monitoring for target MAV population goals. Seasonal closures of sanctuaries.	Enhance habitat and water management capability, farming, and monitoring for target MAV population goals. Enhance public viewing opportunities while enforcing limited access and maximum protection. Seasonal closures of sanctuaries.
<i>Resident Wildlife</i>	Monitor, protect, and control for healthy population levels.	Maximize public access and hunting opportunities. More public education about resident species	Increase levels of monitoring to accomplish optimum population goals.	Increase levels of monitoring to accomplish optimum population goals. More public education about resident species.
<i>Fisheries</i>	Monitor and protect at current levels.	Increased public access and fishing opportunities.	Increase level of monitoring. Expand protection areas near sensitive wildlife habitats.	Increase level of monitoring. Increase public fishing opportunities.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Mgmt Emphasis	Alternative D Balanced Public Use And Habitat Mgmt (Proposed Action)
Habitat Management				
<i>Forests</i>	Conduct forest management practices to achieve habitat management goals and objectives. Intensive restoration (tree planting) and natural regeneration of selected open land.	No active management. Develop interpretive and education programs regarding bottomland hardwood forests in the MAV.	Conduct forest management practices to achieve habitat management goals and objectives. Intensive restoration (tree planting) and natural regeneration of selected and newly acquired open land.	Same as Alt A. Develop interpretive and education programs regarding bottomland hardwood forests in the MAV.
<i>Moist-Soil Units</i>	Develop no additional units. Manage existing units using natural and artificial flooding.	Develop no additional units. Manage existing units at current levels and develop public access opportunities to showcase wildlife benefits of moist-soil management.	Renovate existing units and water control structures. Develop new units and water control structures on existing and newly acquired lands. Continue using natural and artificial flooding.	Renovate existing units and water control structures. Develop new units and water control structures on existing and newly acquired lands. Continue using natural and artificial flooding. Develop public access opportunities to showcase wildlife benefits of moist-soil management.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Mgmt Emphasis	Alternative D Balanced Public Use And Habitat Mgmt (Proposed Action)
<i>Croplands</i>	Maintain existing units utilizing cooperative farming management at current levels.	Reduce croplands and shift management emphasis to support increased public use activities.	Maintain and expand existing units using cooperative and force account farming management. Develop additional units on newly acquired lands.	Maintain and expand existing units using refuge force account farming management. Develop additional units on newly acquired lands. Increase public access opportunities.
<i>Aquatic Resources</i>	Monitor and protect at current levels.	Monitor and protect at current levels and provide public with information about refuge aquatic resources.	Enhance habitat through active habitat management and restoration projects.	Same as Alts. B. And C. combined.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Mgmt Emphasis	Alternative D Balanced Public Use And Habitat Mgmt (Proposed Action)
<b>Visitor Services and Environmental Education</b>				
<i>Fishing</i>	Maintain refuge facilities that support sport fishing at current levels. Continue seasonal closures during waterfowl hunting season.	Develop and increase facilities and access to refuge waters to support sport and commercial fishing.	Increase monitoring of fisheries and provide seasonal closures near sensitive aquatic habitat.	Increase monitoring of fisheries and improve existing facilities that support sport fishing access.
<i>Hunting</i>	Maintain existing facilities and open areas (identified in hunt brochures) at current levels.	Examine seasons and regulations for maximum opportunities and access.	Monitor hunter impacts and use and consider increased closures to protect waterfowl and T&E species habitats and populations.	Examine seasons and regulations for compatible ways to expand hunting opportunities and access, and to enhance refuge hunting experience. Monitor consumptive use through improved data collection and increased monitoring.
<i>Wildlife Observation and Photography</i>	Maintain existing trails, brochures, and tours at current levels. Add kiosks and observation platforms near existing facilities.	Develop self-guided trails, brochures, and signs for wildlife observation and photography. Add kiosks and observation platforms. Open refuge to increased access year-round.	Examine appropriateness of existing trails and tours in light of optimum resource management goals. Some reductions in opportunities due to additional seasonal closures.	If appropriate, increase facilities and guided tours. Add kiosks and observation platforms.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Mgmt Emphasis	Alternative D Balanced Public Use And Habitat Mgmt (Proposed Action)
<i>Environmental Education (EE) and Interpretation</i>	Maintain existing visitor education facilities and interpretive materials that educate visitors about refuge programs.	Increase EE activities, interpretive materials, facilities, and staff and provide year-round experiences. Add new visitor education facility.	Possible new visitor education facility. Examine appropriateness of trails and access in light of optimum resource management goals.	Same as Alts. B and C combined.
<i>Outreach and Awareness</i>	Continue partnering with the State. Maintain existing techniques and partnerships to promote public awareness of fish and wildlife conservation and Federal and State programs.	Continue partnering with the State. Develop new signs, brochures, partnerships, and techniques to expand public awareness of fish and wildlife conservation and Federal and State programs.	Continue partnering with the State. Examine appropriate level of level of public information sharing, in keeping with optimum resource management goals.	Same as Alternative B.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Mgmt Emphasis	Alternative D Balanced Public Use And Habitat Mgmt (Proposed Action)
<b>Refuge Administration and Operation</b>				
<i>Maintenance</i>	Maintain current level of facilities maintenance, based on budget limitations.	Increase maintenance efforts for public use facilities while reducing maintenance efforts for habitat management facilities.	Increase maintenance efforts for habitat management facilities while reducing maintenance efforts for public use facilities.	Increase maintenance of public use and habitat management facilities.
<i>Law Enforcement (LE)</i>	Maintain current staff levels to support existing refuge programs.	Increase law enforcement capability as needed to monitor increased public use.	Decrease LE for reduced public use opportunities. Possible increase in resource law enforcement capability as needed to monitor newly acquired lands.	Increase law enforcement capability to monitor increased public use and newly acquired lands and associated wildlife resources.
<i>Staff</i>	Maintain current staff to support existing refuge programs.	Increase staff to facilitate larger public use program.	Increase staff for habitat management on newly acquired lands while reducing staff for public use programs.	Increase staff as needed to facilitate larger public use program and for habitat management on newly acquired lands.
<i>Operations</i>	Maintain current operations capability to support existing refuge programs.	Increase operations capabilities for public use programs while reducing capabilities for habitat management programs.	Increase operations capabilities for habitat management programs while reducing capabilities for public use programs.	Explore possibilities for increased operations capability for both public use and habitat management programs.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Mgmt Emphasis	Alternative D Balanced Public Use And Habitat Mgmt (Proposed Action)
<b>Land Protection and Conservation</b>				
<i>Land Acquisitions</i>	Land acquisitions within the approved acquisition boundary would continue as willing sellers and funding are available.	Same as Alt. A, but with priority on acquiring lands with greatest potential for public use.  Note: As of February 1, 2004, Lower Hatchie Refuge includes a total of 9,451 acres. The approved acquisition includes an additional 14,122 acres.  Acquisition of the entire approved acquisition area could increase the refuge to a total of 23,227 acres.	Same as Alt A, but with priority on acquiring lands with greatest potential for habitat protection or restoration.	Same as Alt. A, with priority on lands that can provide both public use and habitat protection/restoration potential.
<i>Technical Assistance</i>	Provide current level of technical assistance to landowners, agencies, and individuals.	Decrease emphasis on lands outside refuge as more emphasis is placed on public use of refuge lands.	Explore new techniques and programs for assisting landowners and partners. Increase in staffing.	Same as Alt. C.

<b>Issues</b>	<b>Alternative A No Action</b>	<b>Alternative B Public Use Emphasis</b>	<b>Alternative C Habitat Mgmt Emphasis</b>	<b>Alternative D Balanced Public Use And Habitat Mgmt (Proposed Action)</b>
<i>Resource Protection</i>	Provide current levels of awareness and protection to cultural and natural resources. Continue to work with State to cooperatively manage Sunk Lake Public Use Natural Area (PUNA).	Focus on protection of cultural and natural resources on existing refuge lands. More efforts at public education regarding resource protection. Continue to work with State to cooperatively manage Sunk Lake PUNA.	As public use is reduced, increase protection for cultural and natural resources on existing and newly acquired lands. Continue to work with State to cooperatively manage Sunk Lake PUNA.	Increase levels of awareness of cultural and natural resources on existing and newly acquired lands. Maintain protection at current levels. Continue to work with State to cooperatively manage Sunk Lake PUNA.

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### *ALTERNATIVE B: PUBLIC USE EMPHASIS*

This alternative would emphasize recreational uses and environmental education while maintaining a low-maintenance approach to managing habitats. Additional staff and resources would be dedicated to allow for more public use activities in all areas of the refuge. Bottomland hardwood forests and moist-soil habitat would be maintained on existing refuge lands, but no additional moist-soil units would be developed. Cropland acres would be reduced to accommodate increased public use programs.

New lands would continue to be acquired within the approved acquisition boundaries as willing sellers and funding were available. Priority lands for acquisition in this alternative would be those lands that provide greatest potential for additional public use opportunities.

Control of exotic plants and nuisance wildlife populations would be kept to a minimal and reactive level. Beaver control would be conducted only where necessary to protect property of adjoining landowners. However, the deer herd would be controlled through public hunting, which would be expanded under this alternative. Hunting and fishing seasons and regulations would be examined to provide fewer restrictions and more opportunities.

Secondary recreational uses would be considered for compatibility on refuge lands. The environmental education program could see a visitor education facility, exhibits, and interpretive materials. Additional staff and/or volunteers would be added in an effort to increase on-site public contacts, including enhanced environmental education and interpretation programs on the refuge.

### *ALTERNATIVE C: HABITAT MANAGEMENT EMPHASIS*

Alternative C emphasizes the active and intensive management of existing fish, wildlife, and plant habitats. Additional staff and resources would be dedicated to allow for more habitat management activities in all areas of the refuge, such as tree plantings in converted bottomland forests and prescribed burning. Integrated biological controls and harvest methods would be used to control exotic plant or nuisance wildlife species. The biological research and monitoring program would also receive more attention.

Refuge staff would continue to restore and maintain existing bottomland hardwood forests and moist-soil units, and additional moist-soil units would be developed on existing and newly acquired lands. Cropland habitats would be managed by cooperative and force account farming, and additional units would be developed on newly acquired lands.

New lands would continue to be acquired within the approved acquisition boundaries as willing sellers and funding were available. Priority lands for acquisition in this alternative would be those lands that provide the greatest potential for additional habitat protection or restoration opportunities.

In contrast to the expanding habitat work, new recreational opportunities for visitors would not be pursued and environmental education and outreach programs would remain at the year 2004 level or below. Hunting and fishing seasons and access would continue, but with the possibility of more seasonal closures to protect sensitive wildlife resources. The environmental education program could see a new visitor facility but only minimal improvements in existing exhibits and interpretive materials. A slight increase in public awareness of the refuge is expected due to land protection efforts.

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*ALTERNATIVE D: BALANCED PUBLIC USE AND HABITAT MANAGEMENT (PROPOSED ACTION)*

The preferred alternative would promote more active management of existing fish, wildlife, and plant habitats as well as improved recreational experiences for visitors. The staff would continue to restore and maintain existing bottomland hardwood forests and moist-soil units, and additional moist soil units would be developed on existing and newly acquired lands. Cropland habitats would be managed by cooperative and force account farming, and additional units would be developed on newly acquired lands. Integrated biological controls and harvest methods would be used to more intensively manage wildlife populations and to control exotic plant or nuisance wildlife species.

New lands would continue to be acquired within the approved acquisition boundaries as willing sellers and funding were available. Priority lands for acquisition in this alternative would be those lands that provide potential for additional habitat protection or restoration opportunities, as well as possible public use opportunities.

Hunting and fishing seasons and regulations would be examined to provide compatible access and opportunities. Seasonal closures of waterfowl sanctuaries would continue. The environmental education program would see a new visitor education facility as funding becomes available. Some improvements in existing exhibits and interpretive materials would also occur. New public outreach strategies would result in a greater public understanding of and advocacy for refuge resources. Enhanced programs would provide more opportunities for public use, including environmental education and interpretation, wildlife observation, and photography.

## **COMPARISON OF ALTERNATIVES**

Each alternative, if implemented, will accomplish the refuge vision to some degree, while addressing the issues and concerns identified by the planning and scoping teams and the general public. However, each does so in a different way (Table 2). These dissimilarities cause varying responses to the issues and concerns summarized in Table 3.



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### *III. Affected Environment*

#### **GENERAL**

Lower Hatchie Refuge was established in 1980 as an inviolate sanctuary for migratory birds and to protect a portion of the rapidly vanishing bottomland hardwood forests. The refuge currently encompasses 9,465 acres and is located approximately 3 miles southwest of Henning, Tennessee. The approved acquisition boundary includes an additional 14,122 acres of land, for a potential total of 23,587 acres along the Hatchie River in Tipton and Lauderdale Counties. At full expansion, the refuge boundary would encompass the bulk of the remaining bottomland hardwood forests on the Hatchie River between U. S. Highway 51 and the Mississippi River.

The refuge has excellent potential for wildlife management (particularly waterfowl and other species associated with wetlands and bottomland hardwood forests) and hardwood forest management. Public recreational opportunities are limited in this portion of Tennessee, making Lower Hatchie Refuge an area frequently visited by hunters, fishermen, and wildlife observers throughout the year.

The refuge contains a diversity of habitats, including 75 acres of open water, 5,280 acres of bottomland hardwood forests, 922 acres of upland forests, 887 acres of marshland, 665 acres of grasslands, and 1,278 acres of cropland. The refuge is inhabited by approximately 53 species of mammals, including white-tailed deer, coyote, beaver, mink, muskrat, and raccoon. Several popular game fish species are found in the lakes and rivers on or adjacent to the refuge, including largemouth bass, bluegill, black and white crappie, and channel catfish. Approximately 75 species of reptiles and amphibians are known to inhabit the refuge lands and waters.

During the winter months, tens of thousands of ducks and geese can be seen congregating at the refuge. The large waterfowl numbers attract many bald eagles, which can be seen utilizing the waterfowl sanctuary adjacent to the Mississippi River. Additionally, over 200 species of birds have been observed in the refuge vicinity, with large concentrations of shorebirds, neotropical migratory birds, and wading birds utilizing the refuge during spring and fall migrations. Lower Hatchie Refuge is open year-round to the public with the exception of the 1,200-acre waterfowl sanctuary, which is closed annually from November 15 to March 15.

Sunk Lake PUNA was established in 1986 by the Tennessee Department of Environment and Conservation (TDEC). Sunk Lake PUNA is located in Lauderdale County, approximately 6 miles north of the refuge, and is administered by the refuge through 10-year lease agreements with TDEC. Sunk Lake PUNA encompasses 1,873 total acres and is subdivided into a 1590.5-acre southern unit and a 282.5-acre northern unit. The combined units include 175 acres of open water in eight lakes, 290 acres of cypress swamp, and 1,408 acres of bottomland hardwood forests. Flora and fauna are similar to those found in the aquatic and bottomland hardwood forest portions of Lower Hatchie Refuge. Public use activities are restricted to fishing and nonconsumptive uses on the southern unit. The northern unit is open to small game hunting, archery deer hunting, and nonconsumptive uses. Service management consists primarily of resource protection, maintenance of the boat access area, boundary maintenance, and waterfowl surveys. The southern unit is closed seasonally from November 15 to March 15 to all public access in an effort to protect migratory waterfowl.

More detail on the refuge environment is included in Chapter III of the CCP.

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## THREATENED AND ENDANGERED SPECIES

Three federally listed species known to use the Lower Hatchie vicinity during at least part of their life cycle include the bald eagle (threatened) and the interior least tern (endangered). The pallid sturgeon, a federally endangered species, is known to inhabit the nearby Mississippi River and could enter refuge waters during flood events.

- The bald eagle, a threatened species that the Service plans to de-list, winters in the Mississippi Alluvial Valley of Tennessee in large numbers. Nearby Reelfoot Lake has one of the largest overwintering populations in the lower 48 states. As many as 10 bald eagles have been known to occur in the Lower Hatchie vicinity, but no active nests are known to exist on the refuge.
- The interior least tern is an endangered species, which has a number of active nesting colonies on sandbars within the Mississippi River adjacent to Tennessee. There is a known active nesting colony on a Mississippi River sandbar approximately 1.5 miles south of the refuge, and interior least terns have also been observed resting and feeding on refuge lands at the mouth of the Hatchie River, although no nesting colony exists at that location.
- The pallid sturgeon, an endangered fish, is known to occur within the Mississippi River. It is possible that pallid sturgeon also occur in the Hatchie River and could enter Lower Hatchie Refuge during high river stages; however, this has never been documented and is unlikely due to their small numbers.

## ARCHAEOLOGICAL AND CULTURAL VALUES

Archaeological surveys on the refuge are limited, although numerous investigations have been conducted within nearby portions of west Tennessee. Significant surveys performed in west Tennessee include Mainfort (1994), in which archaeological investigations were made within the Obion River drainage, and Dickson and Campbell (1979), which surveyed cultural resources on Reelfoot and Lake Isom Refuges. These and other reports document an area rich in prehistoric and historic cultural resources, dating back as far as 12,000 B.C. Numerous smaller archaeological resource studies have also been conducted in west Tennessee in conjunction with various Federal development projects.

Archaeological investigations to date on Lower Hatchie Refuge lands are minimal and consist of survey activities conducted in 1992, in response to cultural resources accidentally uncovered by a road grader. The survey, performed by Mainfort (1992) of the Tennessee Division of Archaeology (TDOA), TDEC, found at least 6 archaeological sites, which included several prehistoric houses, human burials, and other cultural features. The area was mapped, cultural resources were observed and catalogued, and recommendations were made for stabilization and preservation of the sites. In addition, Mainfort reports that other cultural sites on the refuge have been identified previously by TDOA. Documentation of known sites is needed to ensure that these cultural sites are adequately protected.

Levee building, road construction, and agricultural activities performed prior to Service ownership have probably adversely impacted archaeological deposits associated with some sites on the refuge. However, it is likely that numerous other undisturbed sites exist and that the number of reported sites is a small fraction of the total number of sites actually present on the refuge lands. In the event that construction or excavation plans are made for refuge lands, additional cultural resource investigations should be performed prior to construction activities, in keeping with the Archaeological Resources Protection Act of 1979, the Antiquities Act of 1906, and other statutes.

More detail on the refuge environment is included in Chapter III of the CCP.

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## *IV. Environmental Consequences*

### **EFFECTS COMMON TO ALL ALTERNATIVES**

Specific environmental and social impacts of implementing each alternative are examined further in the five broad issue categories: fish and wildlife population management, habitat management, visitor services and environmental education, refuge administration and operation, and land protection and conservation. However, a few potential effects will be the same under each alternative and are summarized below:

#### *FISH, WILDLIFE, AND HABITAT*

Each alternative would protect habitat types important to migratory birds, mammals, reptiles, amphibians, fish, and invertebrates, including threatened and endangered species. Alternative B would provide the least amount of habitat protection and management emphasis, while Alternatives C and D would provide the most protection and management. Implementation of any of the four alternatives would benefit and not likely adversely affect threatened or endangered species or habitats.

Overall foraging habitat for waterfowl and shorebirds should improve under all alternatives because of improvements to moist-soil and cropland habitats. Benefits to refuge waterfowl and shorebirds may be less in Alternative B, as a result of less protection and increased public access.

No active bald eagle nests have been documented on the refuge. However, all four alternatives would ensure minimal disturbances of bald eagles and any eagle nests, which may occur in the future on refuge lands. Alternative B might result in a slight increase in disturbance of bald eagles, while Alternative C would provide a greater level of protection from disturbance to bald eagles.

Deer health surveys indicate that deer populations on the refuge are currently at carrying capacity. Under all alternatives, forest and cropland management actions would result in stable or increasing deer populations, as habitat management actions increase the carrying capacity of refuge lands. Increased access and public use under Alternative B could impact deer movement and population levels, as more hunting opportunities are provided. All the alternatives include deer population control through a hunt program.

All alternatives provide additional protection to wetlands beyond the protection afforded by existing wetland regulations. Under all alternatives, riparian areas would be protected and provide travel corridors between the refuge and private lands adjacent to the refuge. Subject to landowner control, wildlife corridors would be restored by private landowners who enroll their lands in private lands conservation programs.

Under all four alternatives, refuge visitation for priority public uses would be expected to build over time as lands are acquired and operational funds are provided. The number of visitors would depend on the season and would grow as the land base increased and more public use programs were provided. Wildlife-dependent recreation described under Alternatives A, B, and D would support the greatest increase in economic activity. Economic benefits would result from increased visitation to the refuge and would directly improve the value of goods and services to local communities such as Henning.

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All four alternatives would decrease gross property tax revenues as additional lands are acquired; however, there would be an increase in refuge revenue sharing payments, as well as increases to the local economy resulting from refuge visitations. The Refuge Revenue Sharing Act requires the Fish and Wildlife Service to make payments to local taxing authorities to offset the loss in tax revenue when land is purchased for a refuge.

Recent trends demonstrate a decline in Federal farm subsidies for crop production (USDA Economic Research Service 2001). Crop prices nationwide have declined as well. As a result, real estate trends demonstrate a marked increase in farm land sales. There is a positive benefit (including tax relief to heirs) for farmers in the Lower Mississippi Valley to restore conditions of marginal farm lands and forest lands located in flood-prone areas for wildlife and enroll properties in conservation easements. All four alternatives advocate the Service acquiring lands in Lake and Obion Counties, Tennessee, and in Fulton County, Kentucky, to enlarge the refuge thereby reducing the available acreage that could be developed. Lands adjacent to the refuge may increase in value, largely due to the value of those properties to private hunting clubs.

Under any of the four alternatives, there would be no significant detrimental impacts to floodplains, prime and unique farmlands, or State-owned conservation areas. Neither minority and low income populations or Indian trust resources would be impacted under any of the four alternatives.

#### *AIR AND WATER QUALITY*

Because of extensive reforestation, subsequent increases in biomass and decreases in agricultural activities, air quality should improve from current levels under all alternatives. Habitat management involving prescribed burning may occur according to an approved Fire Management Plan, currently being developed as part of the CCP process. Smoke management practices will be implemented during all burning events.

All alternatives would positively impact soil formation processes on lands acquired by the refuge. Some disturbances to surface soils and topography would occur at those locations selected for administrative, maintenance, and visitor facilities, as well as in areas targeted for wildlife management practices. Each alternative would protect the natural hydrology of the affected areas. Each alternative would prevent substantial agricultural acreage from being developed if the Service acquired properties or provided assistance to landowners and local conservation partners. Each alternative would maintain groundwater recharge areas and natural catchments to hold and absorb surface waters, thereby minimizing flooding. Refuge management activities and visitor use should not negatively affect water quality. All alternatives would positively impact water quality in individual streams. Other positive impacts include runoff prevention, sediment retention, and minimizing non-point source pollution. Land acquisition in erosion-prone areas will improve water quality in the refuge vicinity.

#### *CULTURAL RESOURCES*

The Fish and Wildlife Service is responsible for managing archaeological and historic sites found on Federal land under its jurisdiction. All four management alternatives afford land protection and low levels of development, thereby producing little negative effect on the cultural and historic environment. Potentially negative actions could include logging and constructing new trails, roads, or facilities. In most cases, these management actions would require review by the Regional Archaeologist and consultation with the Tennessee Historic Preservation Office, as mandated by Section 106 of the National Historic Preservation Act. Cultural resource surveys on the refuge have been limited and indicate that other cultural sites likely exist. Determining whether a particular action within an alternative has the potential to affect cultural or archaeological resources is an ongoing

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process that would occur with the planning stages of every project. Service policy is to preserve these resources in the public trust, avoiding impacts whenever possible.

### *WILDERNESS AREAS*

There is no designated wilderness area within the refuge.

### *ENVIRONMENTAL JUSTICE*

Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations” was signed by President Clinton on February 11, 1994, to focus Federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed Federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, or activities on minority or low-income populations. The Order is also intended to promote nondiscrimination in Federal programs substantially affecting human health and the environment, and to provide minority and low-income communities access to public information and participation in matters relating to human health or the environment.

None of the management alternatives described in this EA will disproportionately place any adverse environmental, economic, social, or health impacts on minority or low-income populations. Implementation of any action alternative that includes public use and environmental education will actually provide a benefit to citizens living in the vicinity of the refuge.

### *CLIMATE CHANGE IMPACTS*

The U.S. Department of the Interior issued an order in January 2001 requiring Federal agencies under its direction, that have land management responsibilities, to consider potential climate change impacts as part of long-range planning endeavors.

The increase of carbon within the earth’s atmosphere has been linked to the gradual rise in surface temperature commonly referred to as global warming. In relation to comprehensive conservation planning for national wildlife refuges, carbon sequestration constitutes the primary climate-related impact to be considered in planning. The U.S. Department of Energy’s “Carbon Sequestration Research and Development” (U.S. DOE 1999) defines carbon sequestration as “...the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere.”

The land is a tremendous force in carbon sequestration. Terrestrial biomes of all sorts – grasslands, forests, wetlands, tundra, perpetual ice, and desert – are effective in both preventing carbon emission and acting as a biological “scrubber” of atmospheric carbon monoxide. The Department of Energy’s report concluded that ecosystem protection is important to carbon sequestration and may reduce or prevent loss of carbon currently stored in the terrestrial biosphere.

Preserving natural habitat for wildlife is the heart of any long-range plan for national wildlife refuges. The actions proposed in the CCP would preserve or restore land and water, and would thus enhance carbon sequestration. This, in turn, contributes positively to efforts to mitigate human-induced global climate changes.

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## **SUMMARY OF EFFECTS BY ALTERNATIVE**

The following section describes the environmental consequences of adopting each refuge management alternative. Table 2 addresses the likely outcomes for specific issues and is organized by broad issue categories.

### *ALTERNATIVE A: NO ACTION*

Existing refuge management and public outreach practices would be favored under this alternative. Continued maintenance and enhancement of bottomland hardwood forests and moist-soil habitats would occur. No additional moist-soil units would be developed. Maintenance of existing cropland habitats would continue to provide an important wildlife food source. Ongoing monitoring efforts would include habitat quality and wildlife distribution and population levels. Land acquisitions would continue within the approved acquisition boundaries as willing sellers and funding became available.

Hunting and fishing seasons and regulations, and seasonal closures, would be used to limit disturbance to waterfowl and other wildlife species. Improvements to existing exhibits and interpretive materials would be used to inform and educate visitors about fish and wildlife management issues. No new visitor education facility would be built.

The current refuge management and programs portion within Chapter IV of the CCP contains more detail about the current management of the refuge.

### *ALTERNATIVE B: PUBLIC USE EMPHASIS*

This alternative would emphasize recreational uses and environmental education while maintaining a low maintenance approach to managing habitats. Public use opportunities would increase as staff time and resources are shifted to emphasize public use programs. An enhanced environmental education program, including a possible new visitor facility, could provide facilities and programs for more quality environmental education and interpretation opportunities to accommodate refuge visitors. Current management would be examined for possible additional hunting and fishing opportunities and access, as well as possible reductions in seasonal closures.

Bottomland hardwood forests and moist-soil habitats would be less intensively managed as staff and resources are shifted to public use programs. Additional staff and resources would be dedicated to allow for more public use activities in all areas of the refuge. Law enforcement and monitoring of visitor activities would be increased. The development of no new moist-soil units would limit potential additional waterfowl habitat. Reduction in cropland acres would result in less wildlife food production and could potentially limit the refuge's ability to attract and hold target waterfowl populations during winter months. Lands would be acquired if willing sellers and funding become available, providing expansions to existing refuge lands and additional public use opportunities.

Reactive control only of beaver populations may result in increased populations and potential damage to bottomland hardwood forests and waterfowl habitat. More liberal hunting and fishing seasons and regulations, and other compatible public uses, would produce added public use opportunities, but could also negatively affect waterfowl populations and other trust species.

### *ALTERNATIVE C: HABITAT MANAGEMENT EMPHASIS*

Alternative C emphasizes the active and intensive management of existing fish, wildlife, and plant habitats. Habitat enhancement, such as silvicultural treatments, tree plantings, and prescribed

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burning, would enhance habitat quality and benefit wildlife populations. Proactive control of nuisance wildlife species and the integration of biological controls and harvest methods would ensure more effective and balanced management of wildlife populations and habitat. An increased biological research and monitoring program would enhance understanding of refuge resources and benefit future management efforts.

Continued maintenance of bottomland hardwood forests and moist-soil units, and development of additional moist-soil units, would provide additional waterfowl habitat. Additional cropland farming units and more intensive management by cooperative and force account farming would significantly increase the refuge's capability to attract and hold target waterfowl populations during winter months. Land acquisitions, if willing sellers and funding are available, would increase the capability of the refuge to protect resources.

Public use opportunities would decrease as new recreational opportunities for visitors would not be pursued and environmental education and outreach programs would remain at the year 2004 level or below. A new visitor education facility could be constructed, but only minor improvements would occur in existing environmental education exhibits and interpretive materials. Hunting and fishing seasons and access would continue, but the possibility of more seasonal closures to protect sensitive wildlife resources might reduce consumptive public use opportunities. A slight increase in public awareness of the refuge is expected due to land protection efforts.

#### *ALTERNATIVE D: BALANCED PUBLIC USE AND HABITAT MANAGEMENT (PROPOSED ACTION)*

The preferred alternative would promote more active management of existing fish, wildlife, and plant habitats, as well as provide for more quality recreational experiences for visitors. Continued maintenance and enhancement of bottomland hardwood forests and moist-soil units, along with development of additional moist-soil units, would provide additional waterfowl habitat. Additional cropland farming units and more intensive management by cooperative and force account farming would significantly increase the refuge's capability to attract target waterfowl populations during winter months. Monitoring efforts for habitat quality and wildlife distribution and population levels would be enhanced. Land acquisitions, if willing sellers and funding are available, would increase the capability of the refuge to protect resources and provide additional public use opportunities.

Hunting and fishing seasons and access, as well as seasonal closures, would be used to limit disturbance to waterfowl and other wildlife species. A possible new visitor education facility and improvements to existing exhibits and interpretive materials would be used to inform and educate visitors. Public outreach strategies would be examined to provide greater public understanding and advocacy for refuge resources. Enhanced public use programs and facilities would provide more opportunities for quality public use, including environmental education and interpretation, wildlife observation, and photography.

#### **CUMULATIVE EFFECTS OF THE PROPOSED ACTION**

There will no significant cumulative impacts on the environment. Cumulative impacts are actions that may be generated by various entities, including other Federal or State agencies, local agencies, non-governmental organizations, and private landowners as each of these groups undertake actions related to land uses. The current size, condition, and configuration of refuge forests are due to previous commercial harvesting impacts, water development projects, and agricultural activities. Cumulatively, these actions have resulted in a lack of sufficient protected native bottomland hardwood forests and forest structures and conditions needed to support increases in forest breeding birds or the protection and recovery of threatened and endangered species.

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The forest wetland environment is heavily influenced by agriculture and water development activities, resulting in diminished quality of the water, soils, and air. These actions are cumulative and occur throughout the Lower Mississippi Valley. Pollution sources in the Lower Mississippi Valley include animal waste, agricultural chemicals, construction, logging, hazardous materials spills, sand and gravel extractions, junkyards, landfills, litter, and debris. These pollution sources are generated by human populations and are cumulative over time. Threats to the refuge's fish and wildlife resources would primarily be from outside their boundaries through increased habitat fragmentation, nutrient loading, and erosion.

## **UNAVOIDABLE ADVERSE EFFECTS OF THE PROPOSED ACTION**

Unavoidable adverse impacts are projected based on changes in levels of management activities described in the Service's proposed action. The effects on the quality of the human environment are not likely to be highly controversial or involve highly uncertain, unique, or unknown environmental risks to the human environment. Alternative D would not lead to a violation of Federal, State, or local laws imposed for the protection of the environment.

Some forest management practices, construction of visitor facilities, and increased visitation may affect local air and water quality, natural vegetation, and soil compaction. Increased visitation would also mean additional disturbances to both resident and migratory wildlife. Increased visitation for wildlife-dependent recreational and environmental education programs may mean fewer refuge acres for public safety purposes. Additional hunting could result in increased conflicts, with some user groups opposing such activity. Wildlife harvests through hunting and trapping would reduce the number of certain species, enabling other species of management concern to increase or recover. Such management actions are necessary in order for the Service to carry out its wildlife resource protection mandates. Although some unavoidable adverse impacts are expected, the benefits to wildlife and habitats outweigh these impacts.

In terms of financial impacts, the residential or industrial development potential of acquired lands would be precluded, which could result in impacts to the local economy. Also, local government would not receive the fiscal benefits of increased property tax receipts. However, this type of impact is expected to be minor. Additionally, the Service is committed to working with willing sellers. It can be assumed that property owners who give up their development rights, by willingly selling lands, do not expect the development potential of their lands to increase greatly, or are simply more interested in land conservation than any monetary gains. Further, the Service makes in-lieu tax payments to the county.

Other positive financial effects include spending associated with refuge visitation. In recent studies (October 2003), economists published "Banking On Nature," an updated version of an original 1997 report on the economic benefit of national wildlife refuges. The report found that in 2002, more than 35.5 million visits to national wildlife refuges fueled more than \$809 million in sales of recreation equipment, food, lodging, transportation, and other expenditures. That figure is more than double the \$401.1 million generated in 1995, the last time the study was conducted.  
[http://Refuges.fws.gov/policyMakers/pdfs/BankingOnNature\\_091703c.pdf](http://Refuges.fws.gov/policyMakers/pdfs/BankingOnNature_091703c.pdf).

## **SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY OF THE PROPOSED ACTION**

Short- and long-term effects describe the relationship between short-term uses of the human environment and maintenance of long-term productivity of the environment.

Short-term economic effects would occur as a result of land purchases. There would be short-term impacts on tax collections for the year in which a property is acquired. In the long term, however,

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land protection would reduce municipal service costs, while providing increased quality of life, essential habitat for wildlife, and outdoor recreation. Any loss in taxes would be at least partially offset by the annual refuge revenue-sharing payments as well as economic benefits associated with refuge visitation, as stated previously.

In the long run, the local economy would be positively impacted by increased spending on environmental programs. The programs would attract visitors and impact tourism and recreation in the region. In the long term, the adverse impacts would be mitigated or offset by the positive impacts from increased open space and quality habitat for plants and animals.

All long-term impacts on biological resources are expected to be beneficial. Sites attracting threatened and endangered species would receive the highest priority for protection. Important stopover, feeding, and breeding habitat for migratory birds would be targeted for acquisition. Aquatic species, wide-ranging species, and species, which require active management, would benefit from habitat improvements, restoration, and land protection actions outlined in the CCP. Technical assistance, environmental education, Partners-in-Flight grants, and Challenge Cost-Share Program grants would enhance area sensitive species on dedicated open space, privately owned lands, and refuge lands.

The development of visitor center facilities, trails, observation platforms, hunter check stations, wetland restoration projects, and forest management practices would result in both short-term and long-term physical impacts on soil and vegetation. These impacts would be localized and confined to the immediate area of the development/construction sites. Increased attention to environmental education and recreation programs may result in more audiences being involved in environmental education and recreation and may provide for a greater appreciation of the land.

Long-term beneficial effects include the increased productivity of threatened and endangered species, songbirds, waterfowl, shorebirds, white-tailed deer, small game, and a myriad of other species dependent on refuge habitat. The public would also gain long-term opportunities for recreation and education on some refuge tracts.

Short-term use of refuge lands includes forest regeneration and prescribed restoration improvements, wetlands enhancement, exotic plant control, management for selected species, wildlife inventories, water quality monitoring, and the administration of education and visitor use programs and facilities. These activities would be implemented with a primary goal of assuring the sustained productivity of refuge resources.

## **IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES TO THE PROPOSED ACTION**

Irreversible commitments of resources are those that cannot be reversed and result when an area cannot be returned to its natural condition for an extended period of time. For example, the depletion of old-growth forests is irreversible. Irretrievable commitments of resources occur when a renewable resource is allocated to a given use and cannot be recovered without significant effort.

The costs associated with land acquisition for the refuge would be irreversible. Refuge land acquisition removes the land from private ownership, as well as any potential development benefits. However, such land, once placed in public ownership under the National Wildlife Refuge System, provides a new set of uses and benefits a much broader group of people. Traditional public uses may change, since public uses on a refuge must be shown to be appropriate and compatible with the purposes for which the land is acquired. Structural improvements that are purchased with any land may be declared surplus to government needs, and sold or demolished on site. Federal ownership

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may affect surrounding land-use patterns, local economies, and county tax revenues. Property, located adjacent to refuge lands, generally increases in value, landscapes become protected, revenues to local service businesses increase, and costs to local counties for services decrease.

Management of the refuge and lands acquired would result in an irreversible and irretrievable commitment of funding for operations, administration, and management. Funding and personnel commitments by the Service to purchase and manage refuge lands and facilities render those resources unavailable for other Service programs and projects. The more public use activities and facilities provided, the greater the operating and maintenance costs involved.

Any wetland restoration project would be considered irreversible. Following restoration, the Clean Water Act would make it very difficult to reconvert wetlands on a national wildlife refuge to a drained condition. Irreversible loss of habitat, as part of the Service's proposed action, would occur at construction sites of new facilities.

Animal and plant populations are renewable in different degrees. Construction sites and some habitat management practices may irretrievably damage natural communities, at least for a period of time. These activities would be managed in such a way that the health and viability of wildlife populations would not be threatened.

#### **COMPARISON OF ENVIRONMENTAL CONSEQUENCES OF MANAGEMENT ALTERNATIVES**

Table 3 presents a comparison of the alternatives in regard to their environmental consequences.

**Table 3: Comparison of Environmental Consequences for Management Alternatives for Lower Hatchie National Wildlife Refuge.**

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Mgmt Emphasis	Alternative D Balanced Public Use and Habitat Mgmt (Proposed Action)
<b>Fish and Wildlife Populations Management</b>				
<i>Threatened and Endangered Species (T&amp;E Species)</i>	Stable. Management minimizes disturbance of bald eagles.	Possible increased disturbance of bald eagles as a result of increased public use. Increased public awareness.	Reduced disturbance of bald eagles.	Same as Alt. A. Possible increases in T&E species due to enhanced management and increased public awareness.
<i>Nuisance Wildlife and Invasive Species Control</i>	Stable to decreased beaver populations due to control. Reduction of noxious and/or invasive plants.	Stable to increased beaver populations due to limited and reactive control only. Increased public awareness.	Reduced beaver population and greater level of habitat protection through more beaver control.	Same as Alt. C
<i>Neotropical Migratory Songbirds</i>	Stable but with increasing understanding as result of ongoing monitoring and study.	Greater public awareness but possible increased disturbance due to increased public access.	Benefits to populations as silvicultural practices enhance habitat.	Same as Alt. C. Increasing understanding as result of ongoing monitoring and study. Increased public awareness.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Mgmt Emphasis	Alternative D Balanced Public Use and Habitat Mgmt (Proposed Action)
<i>Migratory Waterfowl and Shorebirds</i>	Stable through limited access and maximum protection. Target MAV population levels through habitat management.	Increased public access, resulting in increased disturbance, could have impacts upon population levels and distribution patterns.	Population increases due to enhanced management.	Population increases due to enhanced management. Increases in public viewing visitations may slightly increase disturbance.
<i>Resident Wildlife</i>	Stable with monitoring, protection, and control.	Possible increased disturbance, due to increased public use, including possible impacts on wildlife behavior, distribution, and abundance. Increased public awareness.	Stable to increasing through increased monitoring and intensive management.	Same as Alt. C
<i>Fisheries</i>	Stable through current monitoring and protection.	Possible increased disturbance due to increased public access.	Positive impacts through increased monitoring and protection. Possible reduction in public use opportunities.	Positive impacts through enhanced management and increased monitoring. More public use opportunities.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Mgmt Emphasis	Alternative D Balanced Public Use and Habitat Mgmt (Proposed Action)
<b>Habitat Management</b>				
<i>Forests</i>	Benefits to forest resources through sound silvicultural practices including, but not limited to, planting and natural regeneration on selected open lands.	Reduction in benefits as result of no active management. Possible increase through disturbance through increased public access. Increased public awareness.	Benefits to forest resources through sound silvicultural practices including, but not limited to, planting and natural regeneration on selected and newly acquired open lands.	Benefits to forest resources through sound silvicultural practices including, but not limited to, planting and natural regeneration on selected and newly acquired open lands. Increased public awareness.
<i>Moist-Soil Units</i>	Beneficial impacts through intensive management of existing units.	Stable impacts with management of existing units and no additional units developed. Increased public awareness.	Beneficial impacts through intensive management and additional units developed on existing and newly acquired lands.	Beneficial impacts through intensive management and additional units developed on existing and newly acquired lands. Increased public awareness.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Mgmt Emphasis	Alternative D Balanced Public Use and Habitat Mgmt (Proposed Action)
<i>Croplands</i>	Stable impacts due to ongoing management and maintenance of existing units.	Reduction in wildlife benefits due to reduction in cropland management. Increased public awareness.	Beneficial impacts due to development of additional units on existing and newly acquired lands and more intensive management, including cooperative and force account farming.	Beneficial impacts due to development of additional units on existing and newly acquired lands and more intensive management, including force account farming. Increased public awareness.
<i>Aquatic Resources</i>	Stable impacts with monitoring and protection.	Increased public awareness.	Enhancement through land acquisitions and more intensive management	Enhancement through land acquisitions and more intensive management. Increased public awareness.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Mgmt Emphasis	Alternative D Balanced Public Use and Habitat Mgmt (Proposed Action)
<b>Visitor Services and Environmental Education</b>				
<i>Fishing</i>	Stable impacts under current management.	More opportunities through improved access and facilities. Increased numbers of fishermen (requiring additional enforcement efforts).	Positive benefits from increased monitoring. Benefits to quality of fishing through additional fisheries management activities. Possible reductions in fishing opportunities due to seasonal closures.	More opportunities through improved access and facilities. Positive benefits from increased monitoring. Benefits to quality of fishing through additional fisheries management activities.
<i>Hunting</i>	Stable level of opportunities according to existing seasons/units.	Increased opportunities with longer seasons and reduced closures (requiring additional law enforcement efforts). Possible negative impacts to migratory bird target population objectives.	Increased quality of hunting with more intensive management. Possible reduction in opportunities due to additional seasonal closures.	Increased quality of hunting with more intensive management. Possible increased opportunities.
<i>Wildlife Observation and Photography</i>	Stable opportunities through current programs and existing facilities.	Significant increase in opportunities through more trails, facilities, and access.	Fewer opportunities through increased seasonal closures.	More opportunities through land acquisitions and enhanced facilities.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Mgmt Emphasis	Alternative D Balanced Public Use and Habitat Mgmt (Proposed Action)
<i>Environment / Education and Interpretation</i>	Increase in opportunities through expanded programs and facilities.	Significant increase in opportunities through facilities, staff, access, and new visitor facility.	Some increase in opportunities due to possible new visitor education facility. Overall, reduced emphasis on program and more seasonal closures.	Same as Alt. B
<i>Outreach and Awareness</i>	Stable level of public information sharing.	Increased levels through new partnering and information-sharing efforts.	Stable level of public information sharing, in keeping with optimum resource management goals.	Same as Alt. B.
<b>Refuge Administration and Operation</b>				
<i>Maintenance</i>	Current maintenance levels (funding levels inadequate to effectively maintain current programs and facilities).	Increased maintenance of public use facilities; maintenance of habitat management facilities decreases.	Maintenance of habitat management facilities increases with some reduction of maintenance of public use facilities.	Maintenance of both public use facilities and habitat management facilities increases. Budget and personnel needs increase.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Mgmt Emphasis	Alternative D Balanced Public Use and Habitat Mgmt (Proposed Action)
<i>Law Enforcement (LE)</i>	Current levels of LE (current levels inadequate to address LE needs).	Increased LE needed due to increased public use plus existing unmet need referred to under Alternative A.	Reduced LE need resulting from less public use balances out increased LE needs on newly acquired lands plus existing unmet need referred to under Alternative A. .	Increased LE needed due to newly acquired lands and increased public use plus existing unmet need referred to under Alternative A.
<i>Staff</i>	Existing staff maintains current programs.	Staff emphasis shifted from habitat management to public use. Possible staff increase needed for increased public use programs.	Shift staff emphasis from public use to habitat management. Possible staff increase needed due to additional land acquisitions.	Staff increases needed for both public use and habitat management programs.
<i>Operations</i>	Current levels of operation maintained as supported by current budget (refuge resources being adversely impacted by current budgetary shortfall).	Operations emphasis shifted from habitat management to public use programs. Increase in operations funding needs.	Operations emphasis shifts from public use programs to habitat management. Increase in operational budget needs.	Operations needs for both public use and habitat management operations increases. Budget needs increase.

Issues	Alternative A No Action	Alternative B Public Use Emphasis	Alternative C Habitat Mgmt Emphasis	Alternative D Balanced Public Use and Habitat Mgmt (Proposed Action)
<b>Land Protection and Conservation</b>				
<i>Technical Assistance</i>	Stable impacts as current level of technical assistance is provided to landowners, agencies, and individuals.	Program emphasis decreased. Lands outside refuge negatively impacted due to less protection of soil and water, less revegetation.	Beneficial impacts to lands outside refuge as program is increased. Positive impacts to soil, water, and revegetation of cleared lands.	Same as Alt. C.
<i>Land Acquisitions</i>	Increased protection for any lands acquired within current boundary.	Increased land protection benefits as new lands acquired. Increased public use on newly acquired lands.	Increased land protection benefits as new lands acquired. Increased habitat management on newly acquired lands.	Increased land protection benefits as new lands acquired. Increased public use and habitat management on newly acquired lands.
<i>Resource Protection</i>	Protection of natural and cultural resources is maintained at current levels on refuge and adjacent lands.	Increased public awareness of cultural and natural resources. Some reduction in protection of natural resources due to increased public use.	Greater level of protection for cultural and natural resources on existing and newly acquired lands. Reduced public awareness.	Protection of natural and cultural resources is maintained at current levels on refuge, adjacent lands, and newly acquired lands. Increased public awareness.

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## *VI. Consultation and Coordination with the Public and Others*

The Lower Hatchie National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment have been written with the participation of Service staff, refuge users, environmental resource professionals, and the local community. The CCP planning process began in January 2000, when a core group was formed to begin the biological planning for an interagency effort in west Tennessee, which incorporated approximately 10,000 square miles of private, State, and Federal lands. This effort eventually produced the WTWR Conservation Plan, which serves as the biological foundation for four west Tennessee refuge CCPs, including this CCP. Later that same year, a planning team was formed for the Lower Hatchie Refuge CCP, and in November, a public scoping meeting was held in Covington, Tennessee. Comments were received in regard to perceived issues and opportunities on the refuge during the meeting, as well as by mail, e-mail, and telephone. CCP presentations were given to west Tennessee rotary clubs and advertising was done in local newspapers and on radio. A mailing list was developed, which kept interested parties informed as to the progress of the CCP effort. A Planning Review Group, composed of professionals and other individuals with specific knowledge or interest in the refuge, was developed to review documents on refuge issues and to provide comments on the CCP planning as it progressed. This group was composed of State and Federal agency professionals, non-governmental organizations, private businessmen, sportsmen, and local officials. Recommendations from these working groups provided valuable information for the authors of this plan. Please see Chapter II of the CCP for more information on the public scoping/involvement process.



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## SECTION C. APPENDICES

# Appendix I. Glossary

<i>Adaptive Management:</i>	A process in which projects are implemented within a framework of scientifically driven experiments to test predictions and assumptions outlined within the comprehensive conservation plan. The analysis of the outcome of project implementation helps managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.
<i>Alternative:</i>	One set of objectives and strategies that could be used to achieve Refuge goals and the desired future condition.
<i>Approved Refuge Acquisition Boundary:</i>	A refuge boundary which the Fish and Wildlife Service approves for acquisition, contingent upon completion of the planning and environmental compliance process.
<i>Biological Diversity or Biodiversity:</i>	The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur. The National Wildlife Refuge System focus for biodiversity is on indigenous species, biotic communities, and ecological processes.
<i>Bottomland Hardwood Forests:</i>	A community of hardwood tree species that are adapted to growing in seasonally saturated soils and may have their roots inundated for a portion of the growing season.
<i>Canopy:</i>	A layer of foliage; generally the uppermost layer in a forest stand. Canopy can be used to refer to mid- or understory vegetation in multilayered stands. Canopy closure is an estimate of the amount of overhead tree cover (also canopy cover).
<i>Categorical exclusion:</i>	A classification given to Federal actions that do not individually or cumulatively have a significant effect on the human environment in compliance of the National Environmental Policy Act.
<i>CFR:</i>	Code of Federal Regulations.
<i>Compatible Use:</i>	A wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the refuge manager, will not materially interfere with, or detract from, the fulfillment of the mission or the purposes of the refuge. A compatibility determination supports the selection of compatible uses for a specific refuge and identifies stipulations or limits necessary to ensure compatibility.

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<i>Comprehensive Conservation Plan:</i>	A document that: describes the desired future conditions of the refuge; provides long-range guidance and management direction for the refuge manager to accomplish the purposes, goals, and objectives of the refuge; and contributes to the mission of the National Wildlife Refuge System.
<i>Conservation Easement:</i>	A legal document that provides specific land-use rights to a secondary party. A perpetual conservation easement usually grants conservation and management rights to a party in perpetuity.
<i>Cooperative Agreement:</i>	A simple habitat protection action in which no property rights are required. Such an agreement is usually long-term and can be modified by either partner. Lands under a cooperative agreement do not necessarily become part of the National Wildlife Refuge System.
<i>Cooperative Farming:</i>	Farming of refuge cropland by private individuals under the terms of a cooperative agreement.
<i>Corridor:</i>	A route that allows movement of individuals from one region or place to another.
<i>Cover Type:</i>	The present dominant vegetation type of an area.
<i>Cultural Resources:</i>	The remains of sites, structures, or objects used by people of the past.
<i>Deciduous:</i>	Pertaining to perennial plants that are leafless for some time during the year.
<i>Ecological Succession:</i>	The orderly progression of an area through time, in the absence of disturbance, from one vegetative and faunal community to another.
<i>Ecosystem:</i>	A dynamic and interrelating complex of plant and animal communities and their associated non-living environment.
<i>Ecosystem Approach:</i>	A strategy or plan to protect and restore the natural function, structure, and species composition of an ecosystem, recognizing that all components are interrelated.
<i>Ecosystem Management:</i>	Management of the resources of an ecosystem, taking into account all ecological, social, and economic components that make up the whole of the system. Ecosystem management attempts to ensure that all plants and animals in the ecosystem are maintained at viable levels in native habitats and that basic ecosystem processes are perpetuated.
<i>Emergent Growth/Revegetation:</i>	Farmland or logged timber that has been reforested (early succession) or may be naturally revegetated.

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<i>Endangered Species:</i>	A plant or animal species defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range.
<i>Endemic Species:</i>	Plants or animals that occur naturally in a certain region and whose distribution is relatively limited to a particular locality.
<i>Environmental Assessment:</i>	A concise document, prepared in accordance with the National Environmental Policy Act, that briefly discusses the purpose and need for a Federal action as well as alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether or not to prepare an environmental impact statement or finding of no significant impact. Preparation of the document consists of a systematic analysis to determine if proposed actions would result in a significant effect on the quality of the environment.
<i>Even-aged Forests:</i>	Forests that are composed of trees with a time span of less than 20 years between the age of the oldest and youngest individuals.
<i>Fauna:</i>	All of the vertebrate or invertebrate animals of an area.
<i>Federal Trust Species:</i>	All species for which the Federal Government has primary jurisdiction, including federally threatened or endangered species, migratory birds, anadromous fish, and certain marine mammals.
<i>Fee title:</i>	The acquisition of most or all of the rights to a tract of land accomplished by a transfer of property rights with the formal conveyance of a title. While a fee title acquisition involves most rights to a property, certain rights may be reserved or not purchased, including water rights, mineral rights, or use reservation (for example, the ability to continue using the land for a specified time period, or the remainder of the owner's life).
<i>Finding of No Significant Impact (FONSI):</i>	A document prepared in compliance with the National Environmental Policy Act, supported by an environmental assessment, that briefly presents why a Federal action will have no significant effect on the human environment and for which an environmental impact statement, therefore, will not be prepared.
<i>Force Account Farming:</i>	Farming of refuge cropland using refuge staff, equipment, and materials.
<i>Fragmentation:</i>	The process of reducing the size and connectivity of habitat patches through land clearing or other development practices, often resulting in the disruption of extensive habitats into isolated and small patches.

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<i>Goals:</i>	Descriptive, open-ended, and often broad statements of desired future conditions that convey a purpose but do not define measurable units.
<i>Geographic Information System:</i>	A computer system capable of storing and manipulating spatial data which is used widely in land resource quantification and management.
<i>Habitat:</i>	The place where an organism lives. The existing environmental conditions required by an organism for survival and reproduction.
<i>Indicator Species:</i>	A species of plant or animal that is assumed to be sensitive to habitat changes and represents the needs of a larger group of species.
<i>Indigenous:</i>	Having originated in and being produced, growing, living, or occurring naturally in a particular region or environment.
<i>Inholding:</i>	Privately owned land inside the boundary of a national wildlife refuge.
<i>Issue:</i>	Any unsettled matter that requires a management decision. Examples could include: a threat to natural resources, a conflict in uses, or the presence of an undesirable resource condition.
<i>Mid-Succession Forest:</i>	A forest generally characterized by even-age structure resulting from human disturbance such as timber harvest. Mid-successional forest may contain mature trees but the forest as a whole does not exhibit functional or structural characteristics associated with old-growth conditions.
<i>Migratory:</i>	Relating to the seasonal movement from one area to another and back.
<i>Monitoring:</i>	The process of collecting information to track changes of selected parameters over time.
<i>National Environmental Policy Act of 1969:</i>	Legislation which requires all federal agencies, including the Service, to examine the environmental impacts of their actions and incorporate environmental information and public participation in the planning and implementation of such actions. Federal agencies must integrate this Act with other planning requirements, and prepare appropriate policy documents to facilitate better environmental decision making.
<i>National Wildlife Refuge:</i>	A designated area of land, water, or an interest in land or water within the National Wildlife Refuge System.

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<i>National Wildlife Refuge System:</i>	All lands, waters, and interests therein administered by the Fish and Wildlife Service as wildlife refuges, wildlife ranges, game ranges, wildlife management areas, waterfowl production areas, or other areas for the protection and conservation of fish, wildlife, and plant resources.
<i>Native Species:</i>	Species that normally live and thrive in a particular ecosystem and are indigenous to the region.
<i>Neotropical Migratory Bird:</i>	A bird species that breeds north of the United States/Mexican border and winters primarily south of that border, in an area that includes Mexico, the West Indies, Central America, and part of South America.
<i>Natural Levee:</i>	Natural embankment created by soil deposited as a stream over-tops its banks. Located adjacent to a stream, a natural levee is often the highest ground in a bottomland or swamp type area.
<i>Objective:</i>	An objective is a concise, quantitative (where possible) target statement of a desired management outcome. Objectives are derived from goals and provide the basis for determining management strategies. Objectives should be attainable and time-specific.
<i>Old Growth Forest:</i>	Forested areas lacking frequent disturbance to vegetation, usually characterized by dominant species entered into a late successional stage and usually associated with high diversity of species, specialization, and structural complexity.
<i>Planning Area:</i>	A designated area encompassed by a specific planning activity. In refuge planning, a planning area may include lands outside existing unit (Refuge) boundaries that are being studied for inclusion in the unit and/or partnership planning efforts.
<i>Planning Team:</i>	A planning team prepares the comprehensive conservation plan. Planning teams are interdisciplinary in membership and function. A team generally consists of the planning team leader; refuge manager and staff biologists; staff specialists or other representatives of Service programs, ecosystems, or regional offices; and state partnering wildlife agencies as appropriate.
<i>Preferred Alternative:</i>	This is the Service's selected management alternative as identified in the draft comprehensive conservation plan. This is the alternative determined by the decision maker to: best achieve the refuge purpose, vision, and goals; contribute to the refuge system mission and address the significant issues; and be consistent with principles of sound fish and wildlife management.

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<i>Refuge Operating Needs System:</i>	This is a national database which contains the unfunded operational needs of each refuge. Projects included are those required to implement approved plans and meet goals, objectives, and legal mandates.
<i>Refuge Purposes:</i>	These are the purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit.
<i>Scoping:</i>	A process for determining the scope of issues to be addressed by a comprehensive conservation plan and for identifying the significant issues to be addressed in that plan. Involved in the scoping process are federal, state, and local agencies, as well as private organizations and individuals.
<i>Species:</i>	A distinctive kind of plant or animal having distinguishable characteristics, and that can interbreed and produce young. A category of biological classification.
<i>Step-Down Management Plans:</i>	Step-down management plans provide the details necessary for implementation of management strategies and projects identified in the comprehensive conservation plan.
<i>Strategy:</i>	A specific action, tool, or technique or combination thereof, used to achieve unit objectives.
<i>Threatened Species:</i>	Plant or animal species that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range. Threatened species are identified and defined in accordance with the 1973 Endangered Species Act and are published in the Federal Register.
<i>Trust Species:</i>	Species over which the Service has legal authority or managerial responsibility, such as threatened and endangered species, anadromous fish, and migratory birds.
<i>Understory:</i>	Any vegetation with canopy below or closer to the ground than the canopies of other plant layers.
<i>Vegetation:</i>	Plants in general, or the sum total of the plant life in an area.
<i>Vegetation Type:</i>	A categorical description of the existing dominant plant species in a particular area.
<i>Watershed:</i>	The entire land area that collects and drains water into a stream or stream system. Similar in meaning to drainage area or drainage basin.

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<i>Wetland:</i>	Areas such as lakes, marshes, and streams that are inundated by surface or ground water for a long enough period of time each year to support, and that do support under natural conditions, plants and animals that require saturated or seasonally saturated soils.
<i>Wildlife Corridor:</i>	A landscape feature that facilitates the biologically effective transport of animals between larger patches of habitat. Such corridors may facilitate several kinds of traffic, including frequent foraging movement, seasonal migration, or the once-in-a-lifetime dispersal of juvenile animals. These are transition habitats and need not contain all the habitat elements required by migrants for long-term survival or reproduction.
<i>Wildlife-Dependent Recreation:</i>	A use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. The National Wildlife Refuge System Improvement Act of 1997 specifies that these are the six priority general public uses of the system.
<i>Wildlife Diversity:</i>	A measure of the number of wildlife species in an area and their relative abundance.



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## *Appendix III. Relevant Legal Mandates*

American Indian Religious Freedom Act (1978): Directs agencies to consult with native traditional religious leaders to determine appropriate policy changes necessary to protect and preserve Native American religious cultural rights and practices.

Americans with Disabilities Act (1992): Prohibits discrimination in public accommodations and services.

Antiquities Act (1906): Authorizes the scientific investigation of antiquities on Federal land and provides penalties for unauthorized removal of objects taken or collected without a permit.

Archaeological and Historic Preservation Act (1974): Directs the preservation of historic and archaeological data in Federal construction projects.

Archaeological Resources Protection Act (1979) as amended: Protects materials of archaeological interest from unauthorized removal or destruction and requires Federal managers to develop plans and schedules to locate archaeological resources.

Architectural Barriers Act (1968): Requires federally owned, leased, or funded buildings and facilities to be accessible to persons with disabilities.

Clean Water Act (1977): Requires consultation with the Corps of Engineers (404 permits) for major wetland modifications.

Emergency Wetlands Resources Act (1986): Promotes the conservation of migratory waterfowl and offsets or prevents the serious loss of wetlands by the acquisition of wetlands and other essential habitats.

Endangered Species Act (1973): Requires all Federal agencies to carry out programs for the conservation of endangered and threatened species.

Executive Order 11988 (1977): Each Federal agency shall provide leadership and take action to reduce the risk of flood loss and minimize the impact of floods on human safety, and preserve the natural and beneficial values served by the floodplains.

Executive Order 11990: Directs Federal agencies to (1) minimize destruction, loss, or degradation of wetlands and (2) preserve and enhance the natural and beneficial values of wetlands when a practical alternative exists.

Executive Order 12372 (Intergovernmental Review of Federal Programs): Directs the Service to send copies of Environmental Assessments to State planning agencies for review.

Executive Order 12898 (1994): Establishes environmental justice as a Federal government priority and directs all Federal agencies to make environmental justice part of their mission. Environmental justice calls for fair distribution of environmental hazards.

Executive Order 12996 Management and General Public Use of the National Wildlife Refuge System (1996): Defines the mission, purpose, and priority public uses of the National Wildlife Refuge System. It also presents four principles to guide management of the System.

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Executive Order 13006 Locating Federal Facilities on Historic Properties in our Nation's Central Cities: Directs Federal agencies to select, utilize, and maintain historic properties and districts, especially those located in cities' central business districts, whenever operationally appropriate and economically prudent.

Executive Order 13007 Indian Sacred Sites (1996): Directs Federal land management agencies to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, avoid adversely affecting the physical integrity of such sacred sites, and where appropriate, maintain the confidentiality of sacred sites.

Federal Farmland Protection Policy Act (1981) as amended: Minimizes the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses.

Federal Noxious Weed Act (1990): Requires the use of integrated management systems to control or contain undesirable plant species, and an interdisciplinary approach with the cooperation of other Federal and State agencies.

Federal Records Act (1950): Directs preservation of evidence of the government's organization, functions, policies, decisions, operations, and activities, as well as basic historical and other information.

Fish and Wildlife Act (1956): Established a comprehensive national fish and wildlife policy and broadened the authority for acquisition and development of refuges.

Fish and Wildlife Coordination Act (1934) as amended: Requires that the Fish and Wildlife Service and State fish and wildlife agencies be consulted whenever water is to be impounded, diverted, or modified under a Federal permit or license. The Service and State agency recommend measures to prevent the loss of biological resources, or to mitigate or compensate for the damage. The project proponent must take biological resource values into account and adopt justifiable protection measures to obtain maximum overall project benefits. A 1958 amendment added provisions to recognize the vital contribution of wildlife resources to the Nation and to require equal consideration and coordination of wildlife conservation with other water resources development programs. It also authorized the Secretary of the Interior to provide public fishing areas and accept donations of lands and funds.

Fish and Wildlife Improvement Act (1978): Improves the administration of fish and wildlife programs and amends several earlier laws, including the Refuge Recreation Act, the National Wildlife Refuge System Administration Act, and the Fish and Wildlife Act of 1956. It authorizes the Secretary of the Interior to accept gifts and bequests of real and personal property on behalf of the United States. It also authorizes the use of volunteers on Service projects and appropriations to carry out a volunteer program.

Historic Sites, Buildings, and Antiquities Act (1935) as amended: Declares it a national policy to preserve historic sites and objects of national significance, including those located on refuges. Provides procedures for designation, acquisition, administration, and protection of such sites.

Land and Water Conservation Fund Act (1965): Uses the receipts from the sale of surplus Federal land, outer continental shelf oil and gas sales, and other sources for land acquisition under several authorities.

Migratory Bird Conservation Act (1929): Establishes procedures for acquisition by purchase, rental, or gift of areas approved by the Migratory Bird Conservation Commission.

Migratory Bird Hunting and Conservation Stamp Act (1934): Authorized the opening of part of a refuge to waterfowl hunting.

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Migratory Bird Treaty Act (1918): Designates the protection of migratory birds as a Federal responsibility. This Act enables the setting of seasons, and other regulations including the closing of areas, Federal or non-Federal, to the hunting of migratory birds.

National Environmental Policy Act (1969): Requires the disclosure of the environmental impacts of any major Federal action significantly affecting the quality of the human environment.

National Historic Preservation Act (1966) as amended: Requires the Federal Government to provide leadership in the preservation of the Nation's prehistoric and historic resources.

National Trails System Act: Assigns responsibility to the Secretary of the Interior and thus the Service to protect the historic and recreational values of congressionally designated National Historic Trail sites.

National Wildlife Refuge System Administration Act (1966) as amended by the National Wildlife Refuge System Improvement Act (1997) 16 U.S.C. 668dd-668ee. (Refuge Administration Act): Defines the National Wildlife Refuge System and authorizes the Secretary to permit any use of a refuge provided such use is compatible with the major purposes for which the refuge was established. The Refuge Improvement Act clearly defines a unifying mission for the Refuge System; establishes the legitimacy and appropriateness of the six priority public uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation); establishes a formal process for determining compatibility; establishes the responsibilities of the Secretary of the Interior for managing and protecting the Refuge System; and requires a comprehensive conservation plan for each refuge by the year 2012. This Act amended portions of the Refuge Recreation Act and National Wildlife Refuge System Administration Act of 1966.

National Wildlife Refuge System Improvement Act (1997): Considered the "Organic Act" of the National Wildlife Refuge System. Defines the mission of the Refuge System, designates priority wildlife-dependent public uses, and calls for comprehensive refuge planning.

National Wildlife Refuge System Volunteer and Community Partnership Enhancement Act (1998): Amends the Fish and Wildlife Act of 1956 to promote volunteer programs and community partnerships for the benefit of national wildlife refuges, and for other purposes.

Native American Graves Protection and Repatriation Act (1990): Requires Federal agencies and museums to inventory, determine ownership of, and repatriate cultural items under their control or possession.

Refuge Recreation Act (1962): Allows the use of refuges for recreation when such uses are compatible with the primary purposes of refuges and when sufficient funds are available to manage the uses.

Refuge Revenue Sharing Act (1935) as amended: Requires revenue-sharing provisions to all fee-title ownerships that are administered solely or primarily by the Secretary through the Service.

Rehabilitation Act (1973): Requires programmatic accessibility in addition to physical accessibility for all facilities and programs funded by the Federal Government to ensure that anybody can participate in any program.

Rivers and Harbors Act (1899) (U.S.C. 403): Section 10 of this Act requires the authorization by the U.S. Army Corps of Engineers prior to any work in, on, over, or under a navigable water of the United States.

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Surface Mining Control and Reclamation Act (1977) as amended (Public Law 95-87) (SMCRA): Regulates surface mining activities and reclamation of coal-mined lands. Further regulates the coal industry by designating certain areas as unsuitable for coal mining operations.

Transfer of Certain Real Property for Wildlife Conservation Purposes Act (1948): Provides that upon a determination by the Administrator of the U.S. General Services Administration, real property no longer needed by a Federal agency can be transferred without reimbursement to the Secretary of the Interior if the land has particular value for migratory birds, or to a state agency for other wildlife conservation purposes.

Uniform Relocation and Assistance and Real Property Acquisition Policies Act (1970) as amended: Provides for uniform and equitable treatment of persons who sell their homes, businesses, or farms to the Service. The Act requires that any purchase offer be no less than the fair market value of the property.

Wilderness Act (1964) as amended: Directed the Secretary of the Interior, within 10 years, to review every roadless area of 5,000 or more acres and every roadless island (regardless of size) within the National Wildlife Refuge and National Park Systems and to recommend to the President the suitability of each such area or island for inclusion in the National Wilderness Preservation System, with final decisions made by Congress. The Secretary of Agriculture was directed to study and recommend suitable areas in the National Forest System.

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## Appendix IV. Species Lists

Animal and Plant Species of Lower Hatchie National Wildlife Refuge

This is a partial list of animal and plant species found on the refuge. It has been documented and verified by refuge biologists.

### Mammals known to occur on Lower Hatchie National Wildlife Refuge.

Scientific Name	Common Name
<i>Blarina carolinensis</i>	Southern Short-tailed Shrew
<i>Canis latrans</i>	Coyote
<i>Castor canadensis</i>	Beaver
<i>Corynorhinus rafinescruui</i>	Rafinesque's Big-eared Bat
<i>Cryptotis parva</i>	Least Shrew
<i>Dasypus novemcinctus</i>	Nine-banded Armadillo
<i>Didelphis marsupialis</i>	Opossum
<i>Eptesicus fuscus</i>	Big Brown Bat
<i>Felis rufus</i>	Bobcat
<i>Glaucomys volans</i>	Southern Flying Squirrel
<i>Lasionycteris noctivagans</i>	Silver-haired Bat
<i>Lasiurus borealis</i>	Red Bat
<i>Lasiurus cinereus</i>	Hoary Bat
<i>Lasiurus seminolus</i>	Seminole Bat
<i>Lutra canadensis</i>	River Otter
<i>Marmota monax</i>	Woodchuck
<i>Mephitis mephitis</i>	Striped Skunk
<i>Microtus ochrogaster</i>	Prairie Vole
<i>Microtus pinetorum</i>	Pine Vole
<i>Mus musculus</i>	House Mouse
<i>Mustela frenata</i>	Longtail Weasel
<i>Mustela vison</i>	Mink
<i>Myotis austroriparius</i>	Southeastern Myotis
<i>Myotis lucifugus</i>	Little Brown Bat
<i>Neotoma floridana</i>	Eastern Woodrat
<i>Nycticeius humeralis</i>	Evening Bat
<i>Ochrotomys nuttallii</i>	Golden Mouse

<b>Scientific Name</b>	<b>Common Name</b>
<i>Odocoileus virginianus</i>	White-tailed Deer
<i>Ondatra zibethicus</i>	Muskrat
<i>Oryzomys palustris</i>	Marsh Rice Rat
<i>Peromyscus gossypinus</i>	Cotton Mouse
<i>Scientific Name</i>	<i>Common Name</i>
<i>Peromyscus leucopus</i>	White-footed Mouse
<i>Peromyscus maniculatus</i>	Deer Mouse
<i>Pipistrellus subflavus</i>	Eastern Pipistrelle
<i>Procyon lotor</i>	Raccoon
<i>Rattus norvegicus</i>	Norway Rat
<i>Reithrodontomys humulis</i>	Eastern Harvest Mouse
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse
<i>Scalopus aquaticus</i>	Eastern Mole
<i>Sciurus carolinensis</i>	Eastern Gray Squirrel
<i>Sciurus niger</i>	Eastern Fox Squirrel
<i>Sigmodon hispidus</i>	Hispid Cotton Rat
<i>Sorex longirostris</i>	Southeastern Shrew
<i>Spilogale putoris</i>	Spotted Skunk
<i>Sylvilagus aquaticus</i>	Swamp Rabbit
<i>Sylvilagus floridanus</i>	Eastern Cottontail
<i>Synaptomys pinetorum</i>	Southern Bog Lemming
<i>Tamias striatus</i>	Eastern Chipmunk
<i>Urocyon cinereoargenteus</i>	Gray Fox
<i>Vulpes fulva</i>	Red Fox
<i>Zapus hudsonius</i>	Meadow Jumping Mouse

**Amphibians known to occur on Lower Hatchie National Wildlife Refuge.**

Scientific Name	Common Name	Current Status*
<b>Frogs and Toads:</b>		
<i>Acris crepitans crepitans</i>	Northern Cricket Frog	A
<i>Acris gryllus grullus</i>	Southern Cricket Frog	LC
<i>Bufo americanus charlessmithi</i>	Dwarf American Toad	C
<i>Bufo woodhousii fowleri</i>	Fowler's Toad	SA
<i>Gastrophryne carolinensis</i>	Eastern Narrow-mouthed Toad	A
<i>Hyla avivoca</i>	Bird-voiced Treefrog	LC
<i>Hyla chrysoscelis versicolor</i>	Gray Treefrog	SA
<i>Hyla cinerea</i>	Green Treefrog	LC
<i>Pseudacris crucifer crucifer</i>	Northern Spring Peeper	A
<i>Pseudacris triseriata feriarum</i>	Upland Chorus Frog	A
<i>Rana areolata circulosa</i>	Northern Crawfish Frog	U
<i>Rana catesbeiana</i>	Bullfrog	A
<i>Rana clamitans clamitans or melanota</i>	Greenfrog	A
<i>Rana palustris</i>	Pickerel Frog	U
<i>Rana utricularia</i>	Southern Leopard Frog	A
<i>Scaphiopus holbrooki holbrooki</i>	Eastern Spadefoot Toad	LC
<b>Salamanders:</b>		
<i>Ambystoma maculatum</i>	Spotted Salamander	LC
<i>Ambystoma opacum</i>	Marble Salamander	LC
<i>Ambystoma talpoideum</i>	Mole Salamander	U
<i>Ambystoma texanum</i>	Small-mouthed Salamander	C
<i>Ambystoma tigrinum tigrinum</i>	Eastern Tiger Salamander	R
<i>Amphiuma tridactylum</i>	Three-toed Amphiuma	C
<i>Desmognathus fusus conanti</i>	Spotted Dusky Salamander	LC
<i>Eurycea cirrigera</i>	Southern Two-lined Salamander	A

Scientific Name	Common Name	Current Status*
<i>Eurycea longicauda</i>	Long-tailed Salamander	SU
<i>Necturus maculosus maculosus</i>	Mudpuppy	U
<i>Notophthalmus viridescens louisianensis</i>	Central Newt	LC
<i>Plethedon mississippii</i>	Mississippi Slimy Salamander	C
<i>Pseudotriton ruber vioscai</i>	Southern Red Salamander	A
<i>Siren intermedia nettingi</i>	Western Lesser Siren	LC

\* Current Status is derived from the WTWR Conservation Plan (TWRA and USFWS, 2002). This column indicates current status of species in west Tennessee. Key: SA - Super Abundant, A - Abundant, C - Common, LC - Locally Common, U - Uncommon, R - Rare, SU - Status Unknown.

#### Reptiles known to occur on Lower Hatchie National Wildlife Refuge.

Scientific Name	Common Name	Current Status
<b>Lizards:</b>		
<i>Cnemidophorus sexlineatus sexlineatus</i>	Six-lined Racerunner	U
<i>Eumeces fasciatus</i>	Five-lined Skink	A
<i>Eumeces laticeps</i>	Broad-head Skink	A
<i>Ophisaurus attenuatus longicaudus</i>	Eastern Slender Glass Lizard	U
<i>Sceloporus undulatus hyacinthinus</i>	Northern Fence Lizard	A
<i>Scincella lateralis</i>	Ground Skink	SA
<b>Snakes:</b>		
<i>Agkistrodon contortrix contortrix</i> or <i>mokasen</i>	Southern or Northern Copperhead	C
<i>Agkistrodon piscivorus leucostoma</i>	Western Cottonmouth Snake	LC
<i>Carphphis amoenus helenae</i>	Midwest Worm Snake	U
<i>Cemophora coccinea copei</i>	Northern Scarlet Snake	R

Scientific Name	Common Name	Current Status
<i>Coluber constrictor priapus</i> or <i>latrunculus</i>	Southern Black Racer	A
<i>Crotalus horridus</i> <i>atricaudatus</i>	Canebrake Rattlesnake	U
<i>Diadophis punctatus</i> <i>strictogenys</i>	Mississippi Ringneck Snake	A
<i>Elaphe obsoleta spiloides</i>	Gray Rat Snake	A
<i>Faracura abacura reinwardtii</i>	Western Mud Snake	R
<i>Heterodon platyrhinos</i>	Eastern Hognose Snake	U
<i>Lampropeltis caligaster</i> <i>caligaster</i> or <i>rhombomaculata</i>	Prairie King Snake	U
<i>Lampropeltis getula nigra</i> or <i>holbrookii</i>	Speckled King Snake	C
<i>Lampropeltis triangulum</i> <i>syspila</i> or <i>elapsoides</i>	Red Milk Snake	U
<i>Nerodia cyclopion</i>	Green Water Snake	U
<i>Nerodia erythrogaster</i> <i>flavigaster</i>	Yellow-bellied Water Snake	C
<i>Nerodia fasciata confluens</i>	Broad-banded Water Snake	C
<i>Nerodia rhombifer</i>	Diamondback Water Snake	C
<i>Nerodia sipedon pleuralis</i>	Midland Water Snake	C
<i>Opheodrys aestivus</i>	Rough Green Snake	C
<i>Storeiria decayi wrightorum</i>	Midland Brown Snake	C
<i>Storeiria occipitmaculata</i> <i>occipitmaculata</i> or <i>obscura</i>	Northern or Florida Red-bellied Snake	U
<i>Tantilla coronata</i>	Southeastern Crowned Snake	U
<i>Thamnophis proximus</i> <i>proximus</i>	Western Ribbon Snake	U
<i>Thamnophis sauritus</i> <i>sauritus</i>	Eastern Ribbon Snake	C
<i>Thamnophis sirtalis sirtalis</i>	Eastern Garter Snake	SA
<i>Virginia valeriae elegans</i>	Western Smooth Earth Snake	U
<i>Apalone mutica mutica</i>	Smooth Softshell Turtle	U

Scientific Name	Common Name	Current Status
<b>Turtles</b>		
<i>Apalone spinifera spinifera</i>	Eastern Spiny Softshell	C
<i>Chelydra serpentina</i>	Common Snapping Turtle	A
<i>Chrysemys picta dorsalis</i>	Southern Painted Turtle	U
<i>Graptemys kohnii</i>	Mississippi Map Turtle	U
<i>Graptemys pseudogeographica ouachitensis</i>	Ouachita Map Turtle	C
<i>Kinosternon subrubrum subrubrum</i> or <i>hippocrepis</i>	Eastern or Mississippi Mud Turtle	U
<i>Macroclemys temminckii</i>	Alligator Snapping Turtle	R
<i>Pseudemys cocinna hieroglyphica</i> or <i>metteri</i>	Missouri River Cooter	A
<i>Sternotherus odoratus</i>	Stinkpot Turtle	SU
<i>Terrapene carolina carolina</i>	Eastern Box Turtle	C
<i>Trachemys scripta carolina</i>	Red-eared Slider	SA

\* Current Status is derived from the WTWR Conservation Plan (TWRA and USFWS, 2002). This column indicates current status of species in west Tennessee. Key: SA - Super Abundant, A - Abundant, C - Common, LC - Locally Common, U - Uncommon, R - Rare, SU - Status Unknown.

**Birds known to occur on Lower Hatchie National Wildlife Refuge and residence status.**

<b>Scientific Name</b>	<b>Common Name</b>	<b>Residence</b>	<b>Status</b>
<i>Accipiter cooperii</i>	Cooper's Hawk	Permanent resident	State Thr.
<i>Accipiter striatus</i>	Sharp-shinned hawk	Migrant	State Thr.
<i>Actitis macularia</i>	Spotted Sandpiper	Migrant	
<i>Agelaius phoeniceus</i>	Red-winged Blackbird	Permanent resident	
<i>Aix sponsa</i>	Wood Duck	Breeds	
<i>Ammodramus leconteii</i>	LeConte's Sparrow	Migrant	
<i>Ammodramus savannarum</i>	Grasshopper Sparrow	Breeds	
<i>Ammospiza caudacuta nelsoni</i>	Nelson's Sharp-tailed Sparrow	Migrant	
<i>Anas acuta</i>	Northern Pintail	Migrant	
<i>Anas americana</i>	American Widgeon	Migrant	
<i>Anas clypeata</i>	Northern Shoveler	Migrant	
<i>Anas crecca</i>	Green-winged Teal	Migrant	
<i>Anas discors</i>	Blue-winged Teal	Migrant	
<i>Anas platyrhynchos</i>	Mallard	Breeds	
<i>Anas platyrhynchos</i>	Mallard	Breeds	
<i>Anas rubripes</i>	American Black Duck	Migrant	
<i>Anas strepera</i>	Gadwall	Migrant	
<i>Anhinga anhinga</i>	Anhinga	Migrant	
<i>Anser albifrons</i>	Greater White-fronted Goose	Migrant	
<i>Anthus spinoletta</i>	American Pipit	Migrant	
<i>Aquila chrysaetos</i>	Golden Eagle	Migrant	State End.
<i>Archilochus colubris</i>	Ruby-throated Hummingbird	Breeds	

Scientific Name	Common Name	Residence	Status
<i>Ardea herodias</i>	Great Blue Heron	Permanent resident	
<i>Asio flammeus</i>	Short-eared Owl	Migrant	
<i>Aythya affinis</i>	Lesser Scaup	Migrant	
<i>Aythya collaris</i>	Ring-necked Duck	Migrant	
<i>Aythya marila</i>	Greater Scaup	Migrant	
<i>Aythya mericana</i>	Redhead	Migrant	
<i>Aythya valisineria</i>	Canvasback	Migrant	
<i>Batramia longicauda</i>	Upland Sandpiper	Migrant	
<i>Bombycilla cedrorum</i>	Cedar Waxwing	Migrant	
<i>Botaurus lentiginosus</i>	American Bittern	Migrant	
<i>Branta canadensis</i>	Canada Goose	Resident/migrant	
<i>Bubo virginianus</i>	Great Horned Owl	Permanent resident	
<i>Bubulcus ibis</i>	Cattle Egret	Summer resident	
<i>Bucephala albeola</i>	Bufflehead	Migrant	
<i>Bucephala clangula</i>	Common Goldeneye	Migrant	
<i>Buteo jamaicensis</i>	Red-tailed Hawk	Permanent resident	
<i>Buteo lagopus</i>	Rough-legged Hawk	Migrant	
<i>Buteo lineatus</i>	Red-shouldered Hawk	Permanent resident	
<i>Buteo platypterus</i>	Broad-winged Hawk	Summer resident	
<i>Butorides striatus</i>	Green Heron	Breeds	
<i>Calcarius lapponicus</i>	Lapland Longspur	Migrant	
<i>Calidris himantopus</i>	Stilt Sandpiper	Migrant	
<i>Calidris mauri</i>	Western Sandpiper	Migrant	
<i>Calidris melanotos</i>	Pectoral Sandpiper	Migrant	

Scientific Name	Common Name	Residence	Status
<i>Calidris minutilla</i>	Least Sandpiper	Migrant	
<i>Calidris pusilla</i>	Semipalmated Sandpiper	Migrant	
<i>Caprimulgus carolinensis</i>	Chuck-will's-widow	Migrant	
<i>Caprimulgus vociferus</i>	Whip-poor-will	Migrant	
<i>Cardinalis cardinalis</i>	Northern Cardinal	Permanent resident	
<i>Carduelis pinus</i>	Pine Siskin	Migrant	
<i>Carduelis tristis</i>	American Goldfinch	Permanent resident	
<i>Carpodacus mexicanus</i>	House Finch	Breeds	
<i>Carpodacus purpureus</i>	Purple Finch	Migrant	
<i>Casmerodius albus</i>	Great Egret	Summer resident	
<i>Cathartes aura</i>	Turkey Vulture	Permanent resident	
<i>Catharus fuscescens</i>	Veery	Migrant	
<i>Catharus guttatus</i>	Hermit Thrush	Migrant	
<i>Catharus minimus</i>	Gray-cheeked Thrush	Migrant	
<i>Catharus ustulatus</i>	Swainson's Thrush	Migrant	
<i>Catoptrophorus semipalmatus</i>	Willet	Migrant	
<i>Certhia americana</i>	Brown Creeper	Migrant	
<i>Ceryle alcyon</i>	Belted Kingfisher	Permanent resident	
<i>Chaetura pelagica</i>	Chimney Swift	Summer resident	
<i>Charadrius melodus</i>	Piping Plover	Migrant	
<i>Charadrius semipalmatus</i>	Semipalmated Plover	Migrant	
<i>Charadrius vociferus</i>	Killdeer	Permanent resident	
<i>Chen caerulescens</i>	Snow Goose	Migrant	

Scientific Name	Common Name	Residence	Status
<i>Chen rossii</i>	Ross' Goose	Migrant	
<i>Chlidonias niger</i>	Black Tern	Migrant	
<i>Chondestes grammacus</i>	Lark Sparrow	Migrant	
<i>Chordeiles minor</i>	Common Nighthawk	Summer resident	
<i>Circus cyaneus</i>	Northern Harrier	Migrant	State Thr.
<i>Cistothorus platensis</i>	Sedge Wren	Migrant	
<i>Cistothorus plaustris</i>	Marsh Wren	Migrant	
<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Accidental	
<i>Coccyzus americanus</i>	Yellow-billed Cuckoo	Migrant/Breed	
<i>Colaptes auratus</i>	Northern Flicker	Permanent resident	
<i>Colinus virginianus</i>	Northern Bobwhite	Permanent resident	
<i>Columba livia</i>	Rock Dove	Permanent resident	
<i>Colymbus auritus</i>	Horned Grebe	Migrant	
<i>Contopus borealis</i>	Olive-sided Flycatcher	Breeds	
<i>Contopus virens</i>	Eastern Wood Pewee	Breeds	
<i>Coragyps atratus</i>	Black Vulture	Permanent resident	
<i>Corvus brachyrhynchos</i>	American Crow	Permanent resident	
<i>Corvus ossifragus</i>	Fish Crow	Permanent resident	
<i>Cyanocitta cristata</i>	Blue Jay	Permanent resident	
<i>Cygnus columbianus</i>	Tundra Swan	Migrant	
<i>Dendroica castanea</i>	Bay-breasted Warbler	Migrant	
<i>Dendroica cerulea</i>	Cerulean Warbler	Breeds	
<i>Dendroica coronata</i>	Yellow-rumped Warbler	Migrant	
<i>Dendroica discolor</i>	Prairie Warbler	Migrant	

Scientific Name	Common Name	Residence	Status
<i>Dendroica dominica</i>	Yellow-throated Warbler	Breeds	
<i>Dendroica fusca</i>	Blackburnian Warbler	Migrant	
<i>Dendroica magnolia</i>	Magnolia Warbler	Migrant	
<i>Dendroica pensylvanica</i>	Chestnut-sided Warbler	Migrant	
<i>Dendroica petechia</i>	Yellow Warbler	Breeds	
<i>Dendroica pinus</i>	Pine Warbler	Migrant	
<i>Dendroica striata</i>	Black-poll Warbler	Migrant	
<i>Dendroica tigrina</i>	Cape May Warbler	Migrant	
<i>Dendroica virens</i>	Black-throated Green Warbler	Migrant	
<i>Dolichonyx oryzivorus</i>	Bobolink	Permanent resident	
<i>Dryocopus pileatus</i>	Pileated Woodpecker	Permanent resident	
<i>Dumetella carolinensis</i>	Gray Catbird	Breeds	
<i>Egretta caerulea</i>	Little Blue Heron	Summer Resident	
<i>Egretta thula</i>	Snowy Egret	Summer Resident	
<i>Empidonax minimus</i>	Least Flycatcher	Migrant	
<i>Empidonax traillii</i>	Willow Flycatcher	Breeds	
<i>Empidonax virens</i>	Acadian Flycatcher	Breeds	
<i>Eremophila alpestris</i>	Horned Lark	Permanent resident	
<i>Eudocimus albus</i>	White Ibis	Migrant	
<i>Euphagus carolinus</i>	Rusty Blackbird	Migrant	

Scientific Name	Common Name	Residence	Status
<b>* Introduced</b>			
<i>Euphagus cyanocephalus</i>	Brewer's Blackbird	Migrant	
<i>Falco peregrinus</i>	Peregrine Falcon		
<i>Falco sparverius</i>	American Kestrel	Permanent resident	
<i>Fulica americana</i>	American Coot	Migrant	
<i>Gallinago gallinago</i>	Common Snipe	Migrant	
<i>Gallinula chloropus</i>	Common Moorhen	Migrant	
<i>Gavia immer</i>	Common Loon	Migrant	
<i>Geothlypis trichas</i>	Common Yellowthroat	Breeds	
<i>Guiraca caerulea</i>	Blue Grosbeak	Breeds	
<i>Haliaeetus leucocephalus</i>	Bald Eagle	Migrant/Breeds	Fed. Thr.
<i>Helmitheros vermivorus</i>	Worm-eating Warbler	Migrant	
<i>Himantopus mexicanus</i>	Black-necked Stilt	Migrant	
<i>Hirundo pyrrhonota</i>	Cliff Swallow	Breeds	
<i>Hirundo rustica</i>	Barn Swallow	Breeds	
<i>Hydranassa tricolor ruficollis</i>	Tri-colored Heron	Summer occasional	
<i>Hylocichla mustelina</i>	Wood Thrush	Breeds	
<i>Icteria virens</i>	Yellow-breasted Chat	Breeds	
<i>Icterus galbula</i>	Northern Oriole	Breeds	
<i>Icterus spurius</i>	Orchard Oriole	Breeds	
<i>Ictinia mississippiensis</i>	Mississippi Kite	Migrant/Breeds	State End.
<i>Ixobrychus exilis</i>	Least Bittern	Migrant	
<i>Junco hyemalis</i>	Dark-eyed Junco	Migrant	
<i>Lanius ludovicianus</i>	Loggerhead Shrike	Permanent resident	
<i>Larus argentatus</i>	Herring Gull	Migrant	
<i>Larus delawarensis</i>	Ringed-billed Gull	Migrant	
<i>Larus philadelphia</i>	Bonaparte's Gull	Migrant	

Scientific Name	Common Name	Residence	Status
<b>* Introduced</b>			
<i>Limnodromus griseus scolopaceus</i>	Long-billed Dowitcher	Migrant	
<i>Limnodromus griseus</i>	Short-billed Dowitcher	Migrant	
<i>Limnothlypis swainsonii</i>	Swainson's Warbler	Breeds	
<i>Lophodytes cucullatus</i>	Hooded Merganser	Permanent resident	
<i>Melanerpes carolinus</i>	Red-bellied woodpecker	Permanent resident	
<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker	Permanent resident	
<i>Meleagris gallopavo</i>	Wild Turkey	Permanent resident	
<i>Melospiza georgiana</i>	Swamp Sparrow	Migrant	
<i>Melospiza lincolnii</i>	Lincoln's Sparrow	Migrant	
<i>Melospiza melodia</i>	Song Sparrow	Permanent resident	
<i>Mergus merganser</i>	Common Merganser	Migrant	
<i>Mergus serrator</i>	Red-breasted Merganser	Migrant	
<i>Mimus polyglottos</i>	Northern Mockingbird	Permanent resident	
<i>Mniotilta varia</i>	Black and White Warbler	Migrant	
<i>Molothrus ater</i>	Brown-headed Cowbird	Permanent resident	
<i>Myiarchus crinitus</i>	Great Crested Flycatcher	Breeds	
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron	Permanent resident	
<i>Nycticorax violaceus</i>	Yellow-crowned Night-Heron	Summer Resident	
<i>Oporomis formosus</i>	Kentucky Warbler	Breeds	
<i>Otus asio</i>	Eastern Screech Owl	Permanent resident	
<i>Oxyura jamaicensis</i>	Ruddy Duck	Migrant	
<i>Pandion haliaetus</i>	Osprey	Migrant	State End.
<i>Parula Americana</i>	Northern Parula	Breeds	
<i>Parus bicolor</i>	Tufted Titmouse	Permanent resident	
<i>Parus carolinensis</i>	Carolina Chickadee	Permanent resident	
<i>Passer domesticus</i>	House Sparrow*	Permanent resident	

Scientific Name	Common Name	Residence	Status
<b>* Introduced</b>			
<i>Passerculus sandwichensis</i>	Savannah Sparrow	Migrant	
<i>Passerella iliaca</i>	Fox Sparrow	Migrant	
<i>Passerina cyanea</i>	Indigo Bunting	Breeds	
<i>Pelecanus erythrorhynchos</i>	American White Pelican	Year-round	
<i>Pelidna alpina sakhalina</i>	Dunlin	Migrant	
<i>Phalacrocorax auritus</i>	Double-crested Cormorant	Migrant	
<i>Phalaropus fulicarius</i>	Red-necked Phalarope	Migrant	
<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak	Migrant	
<i>Picoides pubescens</i>	Downy Woodpecker	Permanent resident	
<i>Picoides villosus</i>	Hairy Woodpecker	Permanent resident	
<i>Pipilo erythrophthalmus</i>	Rufous-sided Towhee	Breeds	
<i>Piranga olivacea</i>	Scarlet Tanager	Migrant	
<i>Piranga rubra</i>	Summer Tanager	Breeds	
<i>Pisobia bairdi</i>	Baird's Sandpiper	Migrant	
<i>Pisobia fuscicollis</i>	White-rumped Sandpiper	Migrant	
<i>Pluvialis dominica</i>	Lesser Golden Plover	Migrant	
<i>Podilymbus podiceps</i>	Pied-billed Grebe	Migrant/Breed	
<i>Polioptila caerulea</i>	Blue-gray Gnatcatcher	Breeds	
<i>Poocetes gramineus</i>	Vesper Sparrow	Migrant	
<i>Porzana carolina</i>	Sora	Migrant	
<i>Progne subis</i>	Purple Martin	Breeds	
<i>Protonotaria citrea</i>	Prothonotary Warbler	Breeds	
<i>Quiscalus quiscula</i>	Common Grackle	Permanent resident	
<i>Rallus elegans elegans</i>	King Rail	Breeds	
<i>Rallus limicola</i>	Virginia Rail	Migrant	
<i>Recurvirostra americana</i>	American Avocet	Migrant	
<i>Regulus calendula</i>	Ruby-crowned Kinglet	Migrant	

Scientific Name	Common Name	Residence	Status
<b>* Introduced</b>			
<i>Regulus satrapa</i>	Golden-crowned Kinglet	Migrant	
<i>Riparia riparia</i>	Bank Swallow	Breeds	
<i>Sayornis phoebe</i>	Eastern Phoebe	Breeds	
<i>Scolopax minor</i>	American Woodcock	Breeds	
<i>Seiurus aurocapillus</i>	Ovenbird	Migrant	
<i>Seiurus motacilla</i>	Louisiana Waterthrush	Migrant	
<i>Seiurus noveboracensis</i>	Northern Waterthrush	Migrant	
<i>Setophaga ruticilla</i>	American Redstart	Breeds	
<i>Sialia sialis</i>	Eastern Bluebird	Permanent resident	
<i>Sitta canadensis</i>	Red-breasted Nuthatch	Migrant	
<i>Sitta carolinensis</i>	White-breasted Nuthatch	Permanent resident	
<i>Sphyrapicus varius</i>	Yellow-bellied Sapsucker	Migrant	
<i>Spiza americana</i>	Dickcissel	Breeds	
<i>Spizella passerina</i>	Chipping Sparrow	Breeds	
<i>Spizella pusilla</i>	Field Sparrow	Permanent resident	
<i>Squatarola squatarola</i>	Black-bellied Plover	Migrant	
<i>Steganopus tricolor</i>	Wilson's Phalarope	Migrant	
<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow	Breeds	
<i>Sterna antillarum</i>	Least Tern	Summer resident	
<i>Sterna caspia</i>	Caspian Tern	Migrant	
<i>Sterna forsteri</i>	Forster's Tern	Migrant	
<i>Sterna hirundo</i>	Common Tern	Migrant	
<i>Streptopelia decaocto</i>	Eurasian Collared-Dove*	Permanent resident	
<i>Strix varia</i>	Barred Owl	Permanent resident	
<i>Sturnella magna</i>	Eastern Meadowlark	Permanent resident	
<i>Sturnus vulgaris</i>	European Starling*	Permanent resident	
<i>Tachycineta bicolor</i>	Tree Swallow	Breeds	

Scientific Name	Common Name	Residence	Status
<b>* Introduced</b>			
<i>Thryothorus ludovicianus</i>	Carolina Wren	Permanent resident	
<i>Toxostoma rufum</i>	Brown Thrasher	Breeds	
<i>Tringa flavipes</i>	Lesser Yellowlegs	Migrant	
<i>Tringa melanoleuca</i>	Greater Yellowlegs	Migrant	
<i>Tringa solitaria</i>	Solitary Sandpiper	Migrant	
<i>Troglodytes aedon</i>	House Wren	Migrant	
<i>Troglodytes troglodytes</i>	Winter Wren	Migrant	
<i>Tryngites subruficollis</i>	Buff-breasted Sandpiper	Migrant	
<i>Turdus migratorius</i>	American Robin	Permanent resident	
<i>Tyrannus tyrannus</i>	Eastern Kingbird	Breeds	
<i>Tyto alba</i>	Common Barn Owl	Permanent resident	
<i>Vermivora celata</i>	Orange-crowned Warbler	Accidental	
<i>Vermivora chrysoptera</i>	Golden-winged Warbler	Migrant	
<i>Vermivora peregrina</i>	Tennessee Warbler	Migrant	
<i>Vermivora pinus</i>	Blue-winged Warbler	Migrant	
<i>Vermivora ruficapilla ruficapilla</i>	Nashville Warbler	Migrant	
<i>Vireo bellii</i>	Bell's Vireo	Accidental	
<i>Vireo flavifrons</i>	Yellow-throated Vireo	Breeds	
<i>Vireo gilvus</i>	Warbling Vireo	Breeds	
<i>Vireo griseus</i>	White-eyed Vireo	Breeds	
<i>Vireo olivaceus</i>	Red-eyed Vireo	Breeds	
<i>Vireo philadelphicus</i>	Philadelphia Vireo	Migrant	
<i>Vireo solitarius</i>	Blue-headed Vireo	Migrant	
<i>Wilsonia canadensis</i>	Canada Warbler	Migrant	
<i>Wilsonia citrina</i>	Hooded Warbler	Breeds	
<i>Wilsonia pusilla</i>	Wilson's Warbler	Migrant	
<i>Zenaida macroura</i>	Mourning Dove	Permanent resident	

Scientific Name	Common Name	Residence	Status
<b>* Introduced</b>			
<i>Zonotrichia albicollis</i>	White-throated Sparrow	Migrant	
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow	Migrant	

Sources: Hamel, 1992; Nicholson, 1997; and Robinson, 1990.

**Fishes of the Hatchie River.**

<b>Scientific Name</b>	<b>Common Name</b>
<i>Alosa chrysochloris</i>	Skipjack Herring
<i>Ameiurus melas</i>	Black Bullhead
<i>Ameiurus natalis</i>	Yellow Bullhead
<i>Amia calva</i>	Bowfin
<i>Ammocrypta beanii</i>	Naked Sand Darter
<i>Ammocrypta vivax</i>	Scaly Sand Darter
<i>Aphredoderus sayanus</i>	Pirate Perch
<i>Aplodinotus grunniens</i>	Freshwater Drum
<i>Atractosteus spatula</i>	Alligator Gar
<i>Carassius auratus</i>	Gold Fish*
<i>Carpiodes carpio</i>	River Carpsucker
<i>Carpiodes cyprinus</i>	Quillback
<i>Centrarchus macropterus</i>	Flier
<i>Ctenopharyngodon idella</i>	Grass Carp*
<i>Cycleptus elongatus</i>	Blue Sucker
<i>Cyprinella camura</i>	Bluntnose Shiner
<i>Cyprinella lutrensis</i>	Red Shiner
<i>Cyprinella venusta</i>	Blacktail Shiner
<i>Cyprinus carpio</i>	Common Carp*
<i>Dorosoma cepedianum</i>	Gizzard Shad
<i>Dorosoma petenense</i>	Threadfin Shad
<i>Elassoma zonatum</i>	Banded Sunfish
<i>Erimyzon oblongus</i>	Creek Chubsucker

<b>Scientific Name</b>	<b>Common Name</b>
<i>Esox americanus</i>	Grass Pickerel
<i>Esox niger</i>	Chain Pickerel
<i>Etheostoma asprigene</i>	Mud Darter
<i>Etheostoma chlorosomum</i>	Bluntnose Darter
<i>Etheostoma fusiforme</i>	Swamp Darter
<i>Etheostoma gracile</i>	Slough Darter
<i>Etheostoma histrio</i>	Harlequin Darter
<i>Etheostoma lynceum</i>	Brighteye Darter
<i>Etheostoma parvipinne</i>	Goldstripe Darter
<i>Etheostoma proeliare</i>	Cypress Darter
<i>Etheostoma stigmaeum</i>	Speckled Darter
<i>Etheostoma swaini</i>	Gulf Darter
<i>Etheostoma zonistium</i>	Bandfin Darter
<i>Fundulus dispar</i>	Northern Starhead Topminnow
<i>Fundulus notatus</i>	Blackstripe Topminnow
<i>Fundulus olivaceus</i>	Black Spotted Topminnow
<i>Gambusia affinis</i>	Western Mosquitofish
<i>Hiodon alosoides</i>	Goldeye
<i>Hiodon tergisus</i>	Mooneye
<i>Hybognathus hayi</i>	Cypress Shiner
<i>Hybognathus nuchalis</i>	Silvery Shiner
<i>Hybopsis amnis</i>	Pallid Shiner
<i>Hypentelium nigricans</i>	Northern Hogsucker
<i>Ichthyomyzon castaneus</i>	Chestnut Lamprey

Scientific Name	Common Name
<i>Ictalurus furcatus</i>	Blue Catfish
<i>Ictalurus punctatus</i>	Channel Catfish
<i>Ictiobus bubalus</i>	Smallmouth Buffalo
<i>Ictiobus niger</i>	Black Buffalo
<i>Labidesthes sicculus</i>	Brook Silverside
<i>Lamptera aepyptera</i>	Least Brook Lamprey
<i>Lepisosteus oculatus</i>	Spotted Gar
<i>Lepisosteus platostomus</i>	Shortnose Gar
<i>Lepisosteus osseus</i>	Longnose Gar
<i>Lepomis cyanellus</i>	Green Sunfish
<i>Lepomis gulosus</i>	Warmouth
<i>Lepomis humilis</i>	Orange Spotted Sunfish
<i>Lepomis macrochirus</i>	Bluegill
<i>Lepomis marginatus</i>	Dollar Sunfish
<i>Lepomis megalotus</i>	Longear Sunfish
<i>Lepomis microlophus</i>	Redear Sunfish
<i>Lepomis punctatus</i>	Spotted Sunfish
<i>Lepomis symmetricus</i>	Bantam Sunfish
<i>Luxilus chrysocephalus</i>	Striped Shiner
<i>Lythrurus fumeus</i>	Ribbon Shiner
<i>Lythrurus umbratilis</i>	Redfin Shiner
<i>Machrhybopsis aestivalis</i>	Speckled Chub
<i>Machrhybopsis gelida</i>	Sturgeon Chub
<i>Machrhybopsis storeriana</i>	Silver Chub

<b>Scientific Name</b>	<b>Common Name</b>
<i>Micropterus punctulatus</i>	Spotted Bass
<i>Micropterus salmoides</i>	Largemouth Bass
<i>Minytrema melanops</i>	Spotted Sucker
<i>Morone chrysops</i>	White Bass
<i>Moxostoma erythrurum</i>	Golden Redhorse
<i>Moxostoma poecilurum</i>	Blacktail Redhorse
<i>Notemigonus crysoleucas</i>	Golden Shiner
<i>Noturus gyrinus</i>	Tadpole Madtom
<i>Noturus hildebrandi</i>	Least Madtom
<i>Noturus miurus</i>	Brindled Madtom
<i>Noturus nocturnus</i>	Freckled Madtom
<i>Noturus phaeus</i>	Brown Madtom
<i>Noturus stigmosus</i>	Northern Madtom
<i>Notropis ammophilus</i>	Orangefin Shiner
<i>Notropis atherinoides</i>	Emerald Shiner
<i>Notropis blennioides</i>	River Shiner
<i>Notropis maculatus</i>	Taillight Shiner
<i>Notropis shumardi</i>	Silverband Shiner
<i>Notropis volucellus</i>	Mimic Shiner
<i>Opsopoeodus emiliae</i>	Pugnose Minnow
<i>Percina maculata</i>	Blackside Darter
<i>Percina sciera</i>	Dusky Darter
<i>Percina shumardi</i>	River Darter
<i>Percina vigil</i>	Saddleback Darter

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<b>Scientific Name</b>	<b>Common Name</b>
<i>Pimephales notatus</i>	Bluntnose Minnow
<i>Pimephales vigilax</i>	Bullhead Minnow
<i>Polyodon spathula</i>	Paddlefish
<i>Pomoxis annularis</i>	White Crappie
<i>Pomoxis nigromaculatus</i>	Black Crappie
<i>Pylodictis olivaris</i>	Flathead Catfish
<i>Semotilus atromaculatus</i>	Creek Chub
<i>Stizostedion canadense</i>	Sauger

### Mussels known to occur in the Hatchie River

Table shows the results of Hatchie River mussel surveys conducted by Manning (1981-83), TWRA (1991), and TNC (1999).

Species	1980-83 *	1991	1999
<i>Amblema alicata</i>	C	128	81
<i>Anodonta suborbiculata</i>	UC	32	8
<i>Arcidens confragosus</i>	UC	1	1
<i>Fusconaia ebena</i>	Relic	0	0
<i>Fusconaia flava</i>	R	1	1
<i>Lampsilis cardium</i>	C	26	10
<i>Lampsilis siliquoidea</i>	0	0	1
<i>Lampsilis teres</i>	A	40	53
<i>Lasmigona complanata</i>	UC	6	14
<i>Leptodea fragilis</i>	C	7	21
<i>Ligumia subrostrata</i>	C	30	Relic
<i>Megaloniaias nervosa</i>	C	38	165
<i>Obliquaria reflexa</i>	Relic	0	0
<i>Obovaria jacksoniana</i>	R	0	0
<i>Plectomerus dombeyanus</i>	C	49	145
<i>Plethobasus cyphus</i>	Relic	0	0
<i>Potamilus alatus</i>	0	0	1
<i>Potamilus ohioensis</i>	R	0	2
<i>Potamilus purpuratus</i>	C	74	79
<i>Pyganodon grandis</i>	C	79	69
<i>Quadrula apiculata</i>	0	0	1
<i>Quadrula nodulata</i>	R	6	1

Species	1980-83 *	1991	1999
<i>Quadrula pustulosa</i>	A	161	366
<i>Quadrula quadrula</i>	C	8	19
<i>Strophitus undulates</i>	R	0	0
<i>Toxolasma parvus</i>	C	0	0
<i>Toxolasma texasensis</i>	C	14	12
<i>Tritogonia verrucosa</i>	C	94	98
<i>Truncilla truncata</i>	R	0	0
<i>Uniomerus declives</i>	R	0	9
<i>Uniomerus tetralasmus</i>	C	1	0
<i>Utterbackia imbecillis</i>	UC	0	41
<i>Villosa lienosa</i>	C	3	14
<i>Villosa vibex</i>	C	1	1

\* Manning did not report exact numbers, instead using a ranking system as follows:

A = large numbers observed at most suitable stations.

C = small numbers observed at most suitable stations.

UC = found at less than half of suitable stations.

R = found at only one station, or represented by only a few specimens.

Relic = empty shells only.

**Forest trees and shrubs known to occur on Lower Hatchie National Wildlife Refuge**

<b>Scientific Name</b>	<b>Common Name</b>
<i>Acer barbatum</i>	Florida Maple
<i>Acer negundo</i>	Boxelder
<i>Acer rubrum</i>	Red Maple
<i>Asimina triloba</i>	Pawpaw
<i>Carya aquatica</i>	Bitter Pecan (Water Hickory)
<i>Carya illinoensis</i>	Sweet Pecan
<i>Carya laciniosa</i>	Shellbark Hickory
<i>Carya ovata</i>	Shagbark Hickory
<i>Carya tomentosa</i>	Mockernut Hickory
<i>Celtis laevigata</i>	Sugarberry
<i>Celtis occidentalis</i>	Hackberry
<i>Cephalanthus occidentalis</i>	Buttonbush
<i>Cercis canadensis</i>	Redbud
<i>Cornus drummondii</i>	Roughleaf Dogwood
<i>Cornus florida</i>	Flowering Dogwood
<i>Diospyros virginiana</i>	Persimmon
<i>Fagus grandifolia</i>	American Beech
<i>Forestiera acuminata</i>	Swamp Privet
<i>Fraxinus pennsylvanica</i>	Green Ash
<i>Gleditsia triacanthos</i>	Honey Locust
<i>Gymnocladus dioica</i>	Coffeetree
<i>Ilex deciduas</i>	Possum Haw (Deciduous Holly)
<i>Juglans nigra</i>	Black Walnut

Scientific Name	Common Name
<i>Liquidambar styraciflua</i>	Sweetgum
<i>Liriodendron tulipifera</i>	Yellow Poplar
<i>Maclura pomifera</i>	Osage Orange (Bois D'arc)
<i>Morus rubra</i>	Red Mulberry
<i>Nyssa aquatica</i>	Tupelo
<i>Nyssa sylvatica</i>	Black Gum
<i>Planera aquatica</i>	Water Elm
<i>Platanus occidentalis</i>	Sycamore
<i>Populus deltoides</i>	Eastern Cottonwood
<i>Quercus alba</i>	White Oak
<i>Quercus falcata</i>	Southern Red Oak
<i>Quercus falcata var. pagodaefolia</i>	Cherrybark Oak
<i>Quercus lyrata</i>	Overcup Oak
<i>Quercus michauxii</i>	Swamp Chestnut Oak
<i>Quercus nigra</i>	Water Oak
<i>Quercus nuttallii</i>	Nuttall Oak
<i>Quercus palustris</i>	Pin Oak
<i>Quercus phellos</i>	Willow Oak
<i>Quercus shumardii</i>	Shumard Oak
<i>Quercus stellata</i>	Post Oak
<i>Salix nigra</i>	Black Willow
<i>Sassafras albidum</i>	Sassafras
<i>Taxodium distichum</i>	Baldcypress
<i>Ulmus americana</i>	American Elm

**Herbaceous plants known to occur on Lower Hatchie National Wildlife Refuge.**

<b>Scientific Name</b>	<b>Common Name</b>
<i>Amaranthus retroflexus</i>	Pigweed
<i>Ambrosia artemisiifolia</i>	Common ragweed
<i>Ambrosia trifida</i>	Giant ragweed
<i>Andropogon gerardii</i>	Big bluestem
<i>Andropogon virginicus</i>	Broomsedge
<i>Ammania coccinea</i>	Toothcup
<i>Aster spp.</i>	Aster
<i>Azolla caroliniana</i>	Waterfern
<i>Bidens spp</i>	Beggartick
<i>Chamaecrista fasciculata</i>	Partridge pea
<i>Cyperus erythrorhizos</i>	Red rooted sedge
<i>Cyperus esculentus</i>	Chufa
<i>Cyperus spp.</i>	Flatsedge
<i>Ceratophyllum demersum</i>	Coon's tail
<i>Digitaria didactyla</i>	Crabgrass
<i>Echinochloa colona</i>	Jungle rice
<i>Echinochloa crusgalli</i>	Barnyard Grass
<i>Echinochloa muricata</i>	Wild millet
<i>Eleocharis obtusa</i>	Blunt spikerush
<i>Elodea canadensis</i>	Elodea
<i>Fagopyrum esculentum</i>	Buckwheat
<i>Glycine max</i>	Soybean
<i>Hibiscus moscheutos</i>	Swamp rosemallow
<i>Ipomoea purpurea</i>	Common morning glory

Scientific Name	Common Name
<i>Iva frutescens</i>	Marsh elder
<i>Leersia oryzoides</i>	Rice cut-grass
<i>Lemna spp.</i>	Duckweeds
<i>Leptachloa filiformis</i>	Sprangletop
<i>Nelumbo lutea</i>	American lotus
<i>Nymphaea advena</i>	Yellow pond-lily
<i>Oryza sativa</i>	Rice
<i>Panicum dichotomiflorum</i>	Fall panicum
<i>Panicum virgatum</i>	Switchgrass
<i>Polygonum lapathifolium</i>	Lady's thumb
<i>Polygonum pennsylvanicum</i>	Pennsylvania smartweed
<i>Potamogeton crispus</i>	Curlyleaf pondweed
<i>Pueraria montana</i>	Kudzu
<i>Rhynchospora corniculata</i>	Horned beaked-rush
<i>Sagittaria platyphylla</i>	Delta arrow-head
<i>Saururus cernuus</i>	Lizard's tail
<i>Schizachyrium scoparium</i>	Little bluestem
<i>Sesbania cannabina</i>	Sesbania
<i>Solidago altissima</i>	Goldenrod
<i>Sorghastrum nutans</i>	Indiangrass
<i>Sorghum bicolor</i>	Grain sorghum
<i>Triticum aestivum</i>	Wheat
<i>Utricularia spp.</i>	Bladderwort
<i>Xanthium strumarium</i>	Cocklebur
<i>Zea mays</i>	Corn

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# Appendix V: Decisions and Approvals

## INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

**Originating Person:** Randy Cook, Refuge Manager

**Telephone Number:** 731-287-0650 **E-Mail:** Randy\_Cook@fws.gov

**Date:** \_\_\_\_\_

**PROJECT NAME :** Lower Hatchie National Wildlife Refuge Comprehensive Conservation Plan

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**I. Service Program:**

- Ecological Services
- Federal Aid
- Clean Vessel Act
- Coastal Wetlands
- Endangered Species Section 6
- Partners for Fish and Wildlife
- Sport Fish Restoration
- Wildlife Restoration
- Fisheries
- Refuges/Wildlife

**II. State/Agency:** Tennessee/Fish and Wildlife Service

**III. Station Names:** Lower Hatchie National Wildlife Refuge

**IV. Description of Proposed Action (attach additional pages as needed):** Implementation of the Comprehensive Conservation Plan for Lower Hatchie National Wildlife Refuge by adopting the preferred alternative of Balanced Public Use and Habitat Management, which will provide guidance, management direction, and operation plans for the next 15 years.

**V. Pertinent Species and Habitat:**

**A. Include species/habitat occurrence map:**

As many as 10 bald eagles have been known to winter in the vicinity of Lower Hatchie National Wildlife Refuge, with no known active nests on refuge lands.

There is an active nesting colony of interior least terns known to exist on a Mississippi River sand bar approximately 2 miles south of the refuge, and interior least terns have also been observed resting and feeding on refuge lands at the mouth of the Hatchie River, although no nesting colony exists at that location.

Pallid sturgeon are known to occur within the Mississippi River. It is possible that pallid sturgeon also occur in the Hatchie River and that they could enter Lower Hatchie Refuge during high river stages, however, this has never been documented and is unlikely due to their small numbers.

**B. Complete the following table:**

SPECIES/CRITICAL HABITAT	STATUS <sup>1</sup>
Bald Eagle	T
Interior Least Tern	E
Pallid Sturgeon	E

<sup>1</sup>STATUS: E=endangered, T=threatened, PE=proposed endangered, PT=proposed threatened, CH=critical habitat, PCH=proposed critical habitat, C=candidate species

**VI. Location (attach map):**

- A. Ecoregion Number and Name:** No. 27, Lower Mississippi River
- B. County and State:** Lauderdale and Tipton Counties, Tennessee
- C. Latitude and longitude:** Approximate center of refuge: 89.33 W 35.61 N
- D. Distance (miles) and direction to nearest town:** Approximately 3 miles northeast to Henning, Tennessee.
- E. Species/habitat occurrence:**

Bald eagles occur on the refuge during winter months. No active nests are known to exist on refuge lands.

Interior least terns have active colonies on Mississippi River sandbars within 2 miles of Lower Hatchie Refuge and occasionally feed on the refuge.

Pallid sturgeon are known to occur in the Mississippi River and may occur in the Hatchie River in close proximity to the refuge.

**VII. Determination of Effects:**

**A. Explanation of effects of the action on species and critical habitats in item V. B (attach additional pages as needed):**

SPECIES/ CRITICAL HABITAT	IMPACTS TO SPECIES/CRITICAL HABITAT
Bald Eagle	No negative impacts foreseen; more protection.
Interior Least Tern	No negative impacts foreseen; more protection.
Pallid Sturgeon	No negative impacts foreseen; more protection.

**B. Explanation of actions to be implemented to reduce adverse effects:**

SPECIES/ CRITICAL HABITAT	ACTIONS TO MITIGATE/MINIMIZE IMPACTS
Bald Eagle	Maintain and expand potential nesting and feeding habitat.
Interior Least Tern	Cooperate with COE to monitor occurrence and protection.
Pallid Sturgeon	Continue to monitor for possible occurrence in Mississippi and Hatchie Rivers.

**VIII. Effect Determination and Response Requested:**

SPECIES/ CRITICAL HABITAT	DETERMINATION <sup>1</sup>			RESPONSE <sup>1</sup> REQUESTED
	NE	NA	AA	
Bald Eagle		X		Concurrence
Interior Least Tern		X		Concurrence
Pallid Sturgeon		X		Concurrence

<sup>1</sup>DETERMINATION/RESPONSE REQUESTED:

NE = no effect. This determination is appropriate when the proposed action will not directly, indirectly, or cumulatively impact, either positively or negatively, any listed, proposed, candidate species or designated/proposed critical habitat. Response Requested is optional but a "Concurrence" is recommended for a complete Administrative Record.

NA = not likely to adversely affect. This determination is appropriate when the proposed action is not likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat or there may be beneficial effects to these resources. Response Requested is a "Concurrence".

AA = likely to adversely affect. This determination is appropriate when the proposed action is likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat. Response Requested for listed species is "Formal Consultation". Response Requested for proposed or candidate species is "Conference".

\_\_\_\_\_  
Signature (originating station)

\_\_\_\_\_  
Date

\_\_\_\_\_  
Title

**IX. Reviewing Ecological Services Office Evaluation:**

**A. Concurrence \_\_\_\_\_ Nonconcurrence \_\_\_\_\_**

**B. Formal consultation required \_\_\_\_\_**

**C. Conference required \_\_\_\_\_**

**D. Informal conference required \_\_\_\_\_**

**E. Remarks (attach additional pages as needed):**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Title

\_\_\_\_\_  
Office

## COMPATIBILITY DETERMINATIONS FOR LOWER HATCHIE NATIONAL WILDLIFE REFUGE

This set of compatibility determinations describes the wildlife-dependent and other uses included under the proposed alternative (Alternative D), as described in the Comprehensive Conservation Plan for Lower Hatchie National Wildlife Refuge. It determines the conditions under which each use is considered compatible with the purposes, vision, and goals of the refuge and the mission of the National Wildlife Refuge System. Descriptions and anticipated impacts of each of these uses are addressed separately. However, Refuge Uses through National Wildlife Refuge System Mission sections and the Approval of Compatibility Determinations apply to each use. If one of these uses is considered outside of the Comprehensive Conservation Plan for Lower Hatchie National Wildlife Refuge, then those sections become part of that compatibility determination.

Under the National Wildlife Refuge System Administration Act of 1966, the Refuge Recreation Act of 1962, the National Wildlife Refuge System Improvement Act of 1997, and agency policy, the Service may not permit recreational uses on a national wildlife refuge unless those uses are first determined to be compatible wildlife-dependent uses. The needs of fish, wildlife, and plant resources come first. All public uses must be compatible with these resources. A use is compatible if it is determined that the activity does not materially interfere with, or detract from, the fulfillment of the National Wildlife Refuge System mission or the purposes of the refuge. Furthermore, compatible activities, which depend on healthy fish and wildlife populations, will be recognized as priority public uses. The 1997 law established the priority public uses to be: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

**Refuge Uses:** The following uses were evaluated to determine their compatibility with the Refuge System mission and the purposes of the refuge: 1) Hunting; 2) Recreational Fishing; 3) Environmental Education and Interpretation; 4) Wildlife Observation and Photography; 5) Cooperative Farming; 6) Raccoon Dog Field Trials; 7) Firewood Cutting (personal) 8) Non-motorized Boating; 9) Hiking, Jogging and Walking; 10) Horseback Riding; 11) Off-road Vehicles (Handicapped Use Only); 12) Forest Management; and 13) Resource Research Studies.

**Refuge Name:** Lower Hatchie National Wildlife Refuge

**County:** Lauderdale and Tipton Counties, Tennessee

**Establishing and Acquisition Authorities:**

Migratory Bird Conservation Act, Refuge Recreation Act, Fish and Wildlife Act 1956

**Refuge Purpose(s):**

Establishment purpose: "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act) "... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended). "...for the development, advancement, management, conservation, and protection of fish and wildlife

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resources ..." 16 U.S.C. § 742f(a)(4) "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

### **National Wildlife Refuge System Mission:**

"The mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

**Use:** Hunting

### **Description of Use:**

What is the use? Is the use a priority public use?

Hunting has been permitted as a compatible public use activity on Lower Hatchie National Wildlife Refuge since it was established. Hunting is a priority public use of the Service. The original Hunt Plan was completed, reviewed by the public, and approved in 1981. A revised Hunt Plan (2003) supersedes the original document and subsequent revisions. Refuge hunting seasons generally coincide with State of Tennessee hunting seasons and require only minor changes annually. Portions of the refuge are closed annually to all activity, including hunting, to protect migratory waterfowl wintering on the refuge. Overlapping hunting seasons may be limited to reduce conflicts, and/or prevent safety hazards. Turkey hunting, due to limited populations and extensive interest, is permitted only through limited "quota" drawings. All other hunting activities are permitted with a valid refuge hunt permit, and appropriate State licenses. The refuge hunts have been great wildlife management and public relations tools by providing quality recreational opportunities for the general public, while regulating specific animal populations at desired levels. The Hunt Plan was developed to ensure that the associated public recreation and wildlife management objectives are met in a responsible and consistent manner by means that are compatible with the purposes for which the refuge was established. Service policy concerning hunting on national wildlife refuges, as recorded in Refuge Manual 8 RM 5.1, states: "The Secretary of the Interior is authorized by the National Wildlife Refuge System Administration Act of 1966, as amended, and the Refuge Recreation Act of 1962 to permit hunting on any refuge within the Refuge System upon a determination that hunting is compatible with the major purposes for which such areas were established."

Where would the use be conducted?

Lower Hatchie National Wildlife Refuge is located in the western most portion of Tennessee along the Hatchie and the Mississippi Rivers. Bottomland hardwood forests dominate the refuge, interspersed with managed moist-soil impoundments and agricultural fields. The entire refuge is open to hunting activities during all or part of the hunting seasons, with the exception of administrative and hazardous sites. Portions of the refuge are closed seasonally to all public access in order to provide sanctuary for wintering migratory birds.

When would the use be conducted?

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All hunting seasons are established annually through coordination with the Tennessee Wildlife Resources Agency.

- A. Squirrel season dates and bag limits coincide with the State season and regulations, except that the season is closed during open firearms and muzzleloader deer hunts. There is no spring squirrel season on the refuge.
- B. Raccoon season dates and bag limits coincide with State season and regulations.
- C. Quail season dates and bag limits coincide with State season and regulations, except that the season is closed during open firearms and muzzleloader deer hunts.
- D. Rabbit season dates and bag limits coincide with State season and regulations, except that the season is closed during open firearms and muzzleloader deer hunts.
- E. Opossum season dates and bag limits coincide with State season and regulations.
- F. Deer hunting on the refuge runs concurrently with State seasons and bag limits. The deer hunts are conducted to maximize hunter utilization and minimize disturbance to wintering waterfowl. All deer harvested on Lower Hatchie Refuge count toward the Unit A bag limit established by the Tennessee Wildlife Resources Agency.
- H. Turkey season consists of two or three quota hunts in April of each year. Hunter numbers will be adjusted annually based upon the level of the turkey population. The bag limit will be one male turkey per hunter.
- I. Waterfowl season dates and bag limits coincide with State seasons, except that legal shooting hours are 30 minutes before sunrise to 12:00 noon.

How would the use be conducted?

All hunting activities on the refuge are subject to refuge specific regulations published annually in the Federal Register and in the refuge public use brochure/permit, as well as regulations published by the State of Tennessee. Where these regulations differ, the refuge regulations shall supersede those published by the Tennessee Wildlife Resources Agency.

Why is this use being proposed?

Public hunting opportunities in west Tennessee are limited, with Service-managed refuges and State-managed wildlife management areas representing virtually all the public lands open to hunting. Private lands offer hunting opportunities only to those willing and able to purchase hunting rights through long-term leases or private ownership. The demand for public hunting areas is increasing at an alarming rate, as we shift towards a more urbanized society, and refuges are expected to meet an ever increasingly important part of this demand.

### **Availability of Resources:**

Resources involved in the administration and management of the use:

Funding for the hunting program is borne by annual operation and maintenance funds, which supports activities involving the public, such as recreation, interpretation, environmental education, hunting, and fishing. The cost of operating and maintaining the present upland game and big game hunts and a wild turkey season will be approximately \$8,000 annually. Within the annual refuge budget of approximately \$300,000, the necessary funds are available for administration of the hunting program. Therefore, the program is in compliance with specific funding portions of the Refuge Recreation Act.

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Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs:

Trail Maintenance - \$500

Kiosks - \$100

Parking areas and boat ramps - \$1,000

Signs - \$250

Monitoring costs - \$1,000

Offsetting revenues:

The refuge is a participant in the Recreational Fee Demonstration Project, which currently returns 80 percent of fees generated from recreational activities back to the refuge. At current levels, this provides approximately \$500 to the refuge to provide hunting opportunities.

### **Anticipated Impacts of the Use:**

Short-term impacts:

Lower Hatchie National Wildlife Refuge has been open to small game and big game hunting since its establishment in 1982, with no documented disturbance to refuge habitats and no noticeable impact on the abundance of species hunted or other associated wildlife. In fact, quite the opposite has been realized for all species except the wild turkey whose numbers fluctuate with flooding conditions associated with the Mississippi River. Managed hunting opportunities may result in localized disruption of individual animals' daily routines, but no noticeable effect on populations has been documented. The maintenance of the refuge sanctuary provides ample space for a variety of wildlife species, including the threatened bald eagle, to utilize the refuge during critical periods without disturbance. Restrictions within the hunting program reduce overlapping seasons, which could potentially present public safety concerns.

Long-term impacts:

There has been substantial historical use of this forested wetland area for hunting. Based on available information, there is no indication of adverse biological impacts associated with these activities. The refuge has the latitude to adjust hunting seasons and bag limits annually, or even close the refuge entirely due to safety or habitat condition concerns. Long-term impacts to either wildlife populations or habitats on the refuge are unlikely. As hunting pressure increases on the refuge, alternatives, such as limited quota hunts, can be utilized to limit impacts, as well as expanded sanctuaries to provide additional critical habitats for trust species and/or threatened and endangered species.

Cumulative:

Timing and duration of the refuge's hunting program does not coincide with other popular programs on the refuge, and would not result in cumulative impacts to refuge resources.

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**Public Review and Comment:**

This compatibility determination is provided for public review and comment during the Draft Comprehensive Conservation Plan comment period.

**Determination (check one below):**

Use is Not Compatible.

Use is Compatible with Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

Hunting seasons and bag limits are established annually, and generally fall within the State framework for Tennessee, as agreed upon during annual hunt coordination meetings with State personnel. The refuge has the ability to establish more restrictive seasons and bag limits to prevent over-harvest of individual species on the refuge. All hunters are required to possess a free, refuge hunting brochure/permit, or quota permit, while participating in refuge hunts. Steel shot is required for all persons using shotguns while hunting on the refuge. All other refuge regulations apply. Law enforcement patrols are conducted throughout the hunt seasons to ensure compliance with refuge laws and regulations. Waterfowl hunting is limited to 1/2 day. No hunting or access is allowed in the waterfowl sanctuary areas from November 15 to March 15.

**Justification:**

A primary objective for which the refuge was established is to provide the public with wildlife-dependent recreation. Hunting, which adheres to refuge regulations, is an activity deemed compatible with the purposes of the refuge. Hunting is a viable management tool for controlling populations, especially deer and raccoons. Allowing hunting to continue is consistent with the refuge's establishing purposes and management objectives, and follows current Service policy.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

Categorical Exclusion without Environmental Action Statement

Categorical Exclusion and Environmental Action Statement

Environmental Assessment and Finding of No Significant Impact

Environmental Impact Statement and Record of Decision

**Mandatory 10- or 15-Year Re-evaluation Date:** \_\_\_\_\_

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**Description of Use:**

What is the use? Is the use a priority public use?

Recreational fishing was a traditional use of the area prior to its inclusion to the National Wildlife Refuge System, and continues to be a popular recreational pursuit with the public. Fishing is a priority public use of the Service. The refuge fishing will continue to provide additional public fishing opportunities in a region that is lacking sufficient amounts of acreage open to the public, and current fish populations will continue to support a sustainable harvest under a regulated fishing program. Fishing is limited to the Hatchie River, sloughs, refuge lakes and ponds, and Mississippi River frontage along the western boundary of the refuge. Catfish, bluegill, crappie, white bass, and largemouth bass comprise the most sought after fish species on the refuge. Sunk Lake Public Use Natural Area (PUNA) provides fishing opportunities in the old cypress sloughs named First Water, Second Water, Third Water, Goose Pond, Brushy Slough, and the 500 Pound Hole.

Where would the use be conducted?

Lower Hatchie Refuge currently encompasses 9,424 acres. The refuge protects the remaining bottomland hardwoods in the lower reaches of the Hatchie River. The refuge is important because it lies at the confluence of the Hatchie and Mississippi Rivers and contains ecotypes that support many wetland-dependent species. In addition, the Hatchie River is one of the largest un-channelized, free flowing rivers in the Lower Mississippi Valley. Sunk Lake PUNA, located approximately 5 miles west of Three Points on Sunk Lake Road, encompasses 1,873 acres, which includes 175 acres of open water in eight lakes, 290 acres of cypress swamp, and 1,408 acres of bottomland hardwood forest.

When would the use be conducted?

Fishing is open year-round, with the exception of the waterfowl sanctuary and Sunk Lake PUNA, which are closed to all public access from November 15 - March 15.

How would the use be conducted?

Fishing is conducted on Lower Hatchie Refuge subject to seasons and regulations established by the Tennessee Wildlife Resources Agency. Fishing is further restricted on the refuge by special refuge regulations, which limit access to established boat ramps, prohibits access after dark, prohibits the use of certain fishing methods, prohibits the taking of frogs and turtles, and seasonal closures for the benefit of wintering waterfowl and other trust species.

Why is this use being proposed?

While ample fishing opportunities exist in west Tennessee, the refuge affords visitors unique access to a portion of the largest un-channelized stream in west Tennessee, as well as several relatively undisturbed oxbow lakes.

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**Availability of Resources:**

Resources involved in the administration and management of the use:

Funding for the fishing program is borne by annual operation and maintenance funds, which include activities involving the public, such as recreation, interpretation, environmental education, and hunting and fishing programs. The refuge spends approximately \$5000 of an annual budget of approximately \$300,000 in direct support of the fishing program. Therefore, the program is in compliance with specific funding portions of the Refuge Recreation Act.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs:

Annual maintenance of existing boat ramps - \$200  
Annual maintenance of existing parking areas - \$250  
Annual maintenance of existing roads - \$500

Monitoring costs - \$1,000

Offsetting revenues: None

**Anticipated Impacts of the Use:**

Short-term impacts:

Minor impacts, such as littering and gasoline contamination, would occur but not at a level that would cause great concern. Historically, fishing has been one of the most prominent activities on the refuge. It has resulted in only temporary disturbance to refuge habitats and wildlife populations, and has caused no noticeable impact on the abundance of species sought or on other wildlife affected by anglers. Seasonal closure of sanctuary areas virtually eliminates any impacts of sport fishing during critical periods on wintering trust species.

Long-term impacts:

No long-term impacts are expected.

Cumulative:

No known cumulative impacts are known to occur.

**Public Review and Comment:**

This compatibility determination is provided for public review and comment during the Draft Comprehensive Conservation Plan comment period.

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**Determination (check one below):**

Use is Not Compatible.

Use is Compatible with Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

Refuge fishing seasons are set within the constraints permitted by the State of Tennessee and participants must comply with State fishing and boating regulations. Law enforcement efforts will be directed at ensuring compliance with both State and refuge regulations. Boat launching is allowed at ramps located at the terminus of the Sunk Lake Road, Champion Lake Road, and Club Road. All public access is prohibited from November 15 to March 15 in the waterfowl sanctuary and Sunk Lake PUNA. Only non-motorized boats are permitted on Sunk Lake PUNA. Possession or use of trot lines, limb lines, jug lines, yo-yo's, nets, and associated equipment is prohibited. The taking of frogs and turtles is prohibited.

**Justification:**

Historically, fishing has been one of the most prominent activities on the refuge, resulting in only temporary disturbance to refuge habitats and wildlife populations, and has caused no noticeable impact on the abundance of species sought or other wildlife affected by angler disturbance. Current regulations and restrictions limit the impacts to trust species, and provide a safe and rewarding experience for the refuge visitor. Therefore, the fishing program is compatible with the purposes for which the refuge was established and is in compliance with the National Wildlife Refuge System Act, the Refuge Recreation Act, and the Refuge Improvement Act of 1997.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

Categorical Exclusion without Environmental Action Statement

Categorical Exclusion and Environmental Action Statement

Environmental Assessment and Finding of No Significant Impact

Environmental Impact Statement and Record of Decision

**Mandatory 10- or 15-Year Re-evaluation Date:**\_\_\_\_\_

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**Use:** Environmental Education and Interpretation

**Description of Use:**

What is the use? Is the use a priority public use?

Environmental education and interpretation have been identified in the National Wildlife Refuge System Improvement Act of 1997 as priority public uses provided they are compatible with the purpose for which the refuge was established. Activities would include traditional environmental education, such as teacher-led or staff-led on-site field trips, off-site programs in classrooms, nature study, such as teacher and student workshops, and interpretation of the wildlife resources incorporated in support of facilities such as interpretive trails, kiosks, and the visitor contact station.

Where would the use be conducted?

The entire refuge has the potential to be utilized for environmental education and interpretation.

When would the use be conducted?

This is a year-round activity, conducted on an as-requested basis. Although this activity does not require a Special Use Permit, it is most often closely coordinated with the refuge manager. Opportunities for classroom activities on those portions open to the general public, which do not violate general refuge regulations, may be conducted without coordination with the refuge manager.

How would the use be conducted?

The refuge would serve as an outdoor classroom for a variety of audiences with an interest in wildlife conservation and management. Typically, teachers, students, and others would learn from hands-on demonstrations, projects, and activities delivered by refuge staff. Activities would be conducted on-site utilizing existing refuge facilities. Group size would typically be limited to ensure effective presentation of desired materials, which may be specifically tailored to meet the educational needs of the group.

Why is this use being proposed?

Environmental education and interpretation are utilized to encourage understanding in citizens of all ages to develop land ethic, foster public support, and increase visibility of the refuge.

**Availability of Resources:**

Resources involved in the administration and management of the use:

Currently, these activities are conducted as time and resources permit. Expanding the refuge's volunteer program would provide the needed individuals to conduct these programs.

Kiosks, interpretive signs and brochures, and visitor contact station - \$1,000

On-site activities - \$200

Special equipment, facilities, or improvements necessary to support the use: None

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Maintenance costs:

Kiosk maintenance and annual upgrades - \$500  
Signs, maintenance, and replacement - \$500  
Grounds maintenance and debris removal - \$200

Monitoring costs: None

Offsetting revenues: None

**Anticipated Impacts of the Use:**

Short-term impacts:

The use of on-site, hands-on, action-oriented activities by groups of teachers/students to accomplish environmental education and interpretation objectives may impose a low-level impact on the sites used for these activities. Impacts may include trampling of vegetation and temporary disturbance to wildlife species in the immediate vicinity during such activities. It is not anticipated that such impacts would be permanent.

Long-term impacts:

Current utilization of this use is incidental to overall refuge programs and no long-term negative impacts have been experienced. Long-term beneficial impacts include the furthering of the refuge mission through the education of the general public.

Cumulative:

No negative cumulative impacts are anticipated.

**Public Review and Comment:**

This compatibility determination is provided for public review and comment during the Draft Comprehensive Conservation Plan comment period.

**Determination (check one below):**

Use is Not Compatible.

Use is Compatible with Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

On-site activities should be held where minimal impact would occur. Evaluation of sites and programs should be held periodically to assess if objectives are being met and the resources are not being degraded. If evidence of unacceptable adverse impacts begin to appear, it may be necessary to change the location of outdoor classroom activities.

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**Justification:**

Environmental education and interpretation are used to encourage understanding in citizens of all ages to act responsibly in protecting the ecosystem. They are tools to use in building a land ethic, developing refuge support, and decreasing wildlife violations. Environmental education and interpretation are incidental since full-time staff to conduct activities has only recently been established. However, these programs are important and provide visitors with an awareness of refuge-specific issues, such as wetland ecology, endangered species protection, and migratory bird management, as well as issues relating to the entire Refuge System. Environmental education and interpretation activities are expected to increase while ensuring compatibility with the purpose for which the refuge was established.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

- Categorical Exclusion without Environmental Action Statement
- Categorical Exclusion and Environmental Action Statement
- Environmental Assessment and Finding of No Significant Impact
- Environmental Impact Statement and Record of Decision

**Mandatory 10- or 15-Year Re-evaluation Date:** \_\_\_\_\_

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**Use:** Wildlife Observation and Photography

**Description of Use:**

What is the use? Is the use a priority public use?

Wildlife observation and photography have been identified in the National Wildlife Refuge System Improvement Act of 1997 as priority public uses provided they are compatible with the purpose for which the refuge was established.

Where would the use be conducted?

Lower Hatchie Refuge is open to public use year-round except for areas on the refuge that are designated as waterfowl sanctuary and the Sunk Lake PUNA, all of which are closed from November 15 through March 15. Much of the refuge is subject to flooding, which may result in parts or all of the refuge being closed for safety reasons. Motorized vehicles must remain on designated graveled roads within the refuge.

When would the use be conducted?

The refuge is open to these activities year-round, except on those portions of the refuge that are closed from November 15 through March 15.

How would the use be conducted?

Most of the recreational activities on the refuge are centered on wildlife viewing, which is conducted on refuge roads and at the observation tower. Hiking or walking is many times associated with these activities.

Why is this use being proposed?

Wildlife observation and photography are very popular activities in the surrounding area, and the refuge is one component in a complex of public lands in west Tennessee.

**Availability of Resources:**

Resources involved in the administration and management of the use:

Funding for these programs is borne by annual operation and maintenance funds, which include activities involving the public, such as recreation, interpretation, environmental education, and hunting and fishing programs. The refuge spends approximately \$3,000 of an annual refuge budget of approximately \$300,000 in direct support of these programs on the refuge. Therefore, the program is in compliance with specific funding portions of the Refuge Recreation Act.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs:

Maintenance costs are not directly attributable to these incidental uses on the refuge.

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Monitoring costs: None

Offsetting revenues: None

**Anticipated Impacts of the Use:**

Short-term impacts:

Most of the impacts that could occur would involve some violation of refuge regulations, such as deliberate disturbance of wildlife or plants, littering, or vandalism. Some animals are killed or injured by vehicles while crossing refuge roads. Disturbance to trust species, during critical wintering periods, is avoided by seasonal closure of sanctuary areas. Short-term impacts to facilities, such as roads and structures, can be avoided by special closures due to unsafe conditions.

Long-term impacts:

No long-term negative impacts are anticipated.

Cumulative:

No cumulative negative impacts are anticipated, however, programs may be modified in the future to mitigate unforeseen impacts.

**Public Review and Comment:**

This compatibility determination is provided for public review and comment during the Draft Comprehensive Conservation Plan comment period.

**Determination (check one below):**

Use is Not Compatible.

Use is Compatible with Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

Law enforcement patrolling of public use areas should continue to minimize violations. The current regulation that prohibits entry after daylight hours would be maintained. All seasonal closures are designed to coincide with peak waterfowl use periods. Any major change in waterfowl usage patterns that creates a conflict with public use would prompt further consideration of refuge regulations.

**Justification:**

A primary objective for which the refuge was established is to provide the public with wildlife-oriented recreational opportunities. Wildlife observation and photography are activities that are compatible with the purpose for which the refuge was established.

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**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

- Categorical Exclusion without Environmental Action Statement
- Categorical Exclusion and Environmental Action Statement
- Environmental Assessment and Finding of No Significant Impact
- Environmental Impact Statement and Record of Decision

**Mandatory 10- or 15-Year Re-evaluation Date:** \_\_\_\_\_

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**Use:** Cooperative Farming

**Description of Use:**

What is the use? Is the use a priority public use?

Cooperative farming has been a management tool on Lower Hatchie Refuge since 1982. Primarily serving as a supplement to natural food resources, this program was designed to assist the refuge in meeting wintering waterfowl population goals. Contracts with cooperative farmers are established annually prior to the planting season. These contracts describe the location and amount of acreage to be planted during the coming year. The contract is then signed by the cooperative farmer and the Service representative (refuge manager). Shares are acreage based with a 75 percent cooperator share and a 25 percent refuge share. The cooperator assumes responsibility for all associated costs for the crops raised. Modifications to the original contract may occur throughout the farming season with amendments agreed upon and signed by all parties involved. In addition to providing winter food resources, this program may be utilized to maintain newly acquired tracts of land in an open condition until permanent natural habitat communities can be established. Farming is used to compliment natural food production on the refuge and assist in meeting the minimum waterfowl maintenance objectives of 5.1-million-duck-use-days. Providing wintering and migrating habitat can be achieved in part through a successful cropland program. By incorporating a system of impoundments with the cropland program, the waterfowl maintenance objectives should be easily achieved. Preferred waterfowl crops include corn, milo, millet, wheat, buckwheat, and natural (moist-soil) foods. By planting crops, such as corn or millet in impoundment areas, their availability to waterfowl can be enhanced through flooding in the fall/winter.

Where would the use be conducted?

Cooperative farming is primarily utilized within the waterfowl sanctuary to provide for the needs of wintering waterfowl species without subjecting them to hunting pressure. Newly acquired tracts outside the existing waterfowl sanctuary may be farmed in preparation for the establishment of native habitats.

When would the use be conducted?

Cooperative farming contracts are generally valid from March 15-November 15 annually.

How would the use be conducted?

This activity is a contracted activity, with the cooperator providing all materials, equipment, and labor. Facilities, such as roads and access points, are maintained by refuge staff.

Why is this use being proposed?

This use is deemed necessary to fulfill refuge obligations to provide for the wintering needs of waterfowl. While agricultural lands are abundant off the refuge, they do not provide a secure habitat for wintering waterfowl.

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**Availability of Resources:**

Resources involved in the administration and management of the use:

The refuge currently spends approximately \$8,000 per year in the administration of the refuge cooperative farming program. The cost of providing the same resources for waterfowl, utilizing refuge staff and equipment, would total approximately \$50,000 per year.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs:

Maintenance of roads, trails, and access points for cooperative farmers - \$3,000 (this maintenance also benefits numerous refuge conducted activities)

Monitoring costs:

Monitoring contacts and cooperator activities - \$2,500

Offsetting revenues: None

**Anticipated Impacts of the Use:**

Short-term impacts:

Soil disturbance is likely to occur when areas are disked during the spring planting season, but these impacts can be lessened by the implementation of no-till and conservation tillage farming methods. Buffer strips adjacent to waterway and sensitive areas help trap sediments and hold agricultural run-off. Monotypic stands of agricultural crops reduce the diversity and suitability of refuge lands for a variety of migratory and resident wildlife species.

Long-term impacts: None.

Cumulative:

The cumulative impacts should be minimal if integrated pest management practices and conditions within the cooperative agreement are followed.

**Public Review and Comment:**

This compatibility determination is provided for public review and comment during the Draft Comprehensive Conservation Plan comment period.

**Determination (check one below):**

Use is Not Compatible.

Use is Compatible with Following Stipulations

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**Stipulations Necessary to Ensure Compatibility:**

Cooperative farming agreements, which are contractual agreements between the refuge and local farmers, require that special conditions be met. Cooperators are subject to dismissal for not meeting those conditions. Integrated Pest Management administered by the refuge and implemented by cooperators will help to reduce the potential for chemical misuse. See the Habitat Management Plan for the list of special conditions.

**Justification:**

Section 6 RM 4.1 of the Refuge Manual states, "Service policy is to use the most natural means available to meet wildlife objectives. In situations where objectives cannot be met through maintenance of more natural ecosystems, the more intensive and artificial method of cropland management may be employed. The acreage devoted to croplands will be that required to meet minimum habitat objectives." The specific objective is as follows: To provide wintering waterfowl habitat for: Ducks - 5.1-million-use-days; Geese - 0.5-million- use-days. Although cropland management will be directed primarily to satisfy certain habitat and life requirements of waterfowl, other bird and mammal species will also benefit. The production of crops is essential for waterfowl management to meet the primary objectives for which the refuge was established. Farming is an essential management tool for providing "hot" foods for migratory birds.

How did this economic use of refuge natural resources contribute to the purposes of the refuge or the mission of the National Wildlife Refuge System?

The Habitat Management Plan addresses the management of the refuge farm fields. These fields are farmed by a cooperator under a contractual agreement, issued annually by the refuge. Under this agreement, the refuge receives a 25 percent share of each cooperative farmer's allotment where one acre out of four is planted for waterfowl food production. For their share (75 percent), the cooperative farmers plant primarily soybeans.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

- Categorical Exclusion without Environmental Action Statement
- Categorical Exclusion and Environmental Action Statement
- Environmental Assessment and Finding of No Significant Impact
- Environmental Impact Statement and Record of Decision

**Mandatory 10- or 15-Year Re-evaluation Date:** \_\_\_\_\_

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**Use:** Raccoon Dog Field Trials

**Description of Use:**

What is the use? Is the use a priority public use?

AKC sanctioned and non-sanctioned raccoon dog field trials held by local hunters and raccoon hunting clubs.

Where would the use be conducted?

These activities would occur primarily on the forested areas of the refuge.

When would the use be conducted?

Hunts would be conducted during the mid- to late-summer months, typically 2 to 3 months prior to raccoon season, and would occur for 2-3 consecutive nights.

**Availability of Resources:**

Funding for these programs is borne by annual operation and maintenance funds, which include activities involving the public, such as recreation, interpretation, environmental education, and hunting and fishing programs. The refuge spends approximately \$3000 of an annual refuge budget of approximately \$300,000 in direct support of wildlife-dependent programs on Lower Hatchie Refuge. Therefore, the program is in compliance with specific funding portions of the Refuge Recreation Act.

**Anticipated Impacts of the Use:**

Most of the impacts that could occur would involve some violation of refuge regulations, such as deliberate destruction of wildlife or plants, littering, or vandalism. Wildlife disturbance is a major factor during these activities. This disturbance stresses wildlife in the area, forcing changes in behavior and movements to other areas. Some animals are killed or injured by vehicles while crossing refuge roads.

**Public Review and Comment:**

This compatibility determination is provided for public review and comment during the Draft Comprehensive Conservation Plan comment period.

**Determination (check one below):**

Use is Not Compatible.

Use is Compatible with Following Stipulations

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**Justification:**

A primary objective for which the refuge was established is to provide the public with wildlife-oriented recreational opportunities. However, field trials can have detrimental effects on wildlife through increased disturbance. The activity also occurs at night and safety is a major concern. Also other lands (State and private) are available for this activity.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

- Categorical Exclusion without Environmental Action Statement
- Categorical Exclusion and Environmental Action Statement
- Environmental Assessment and Finding of No Significant Impact
- Environmental Impact Statement and Record of Decision

**Mandatory 10- or 15-Year Re-evaluation Date:** \_\_\_\_\_

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**Use:** Firewood Cutting (Personal)

**Description of Use:**

What is the use? Is the use a priority public use?

The use is collection and removal of residual wood (e.g., limbs, tree tops, and logs), left as a result of reserve timber harvests and stand thinnings, by private individuals for personal home heating and recreational camping. This is a secondary use of resources not suited for commercial harvest as prescribed by the habitat management for timber stand improvements. This use is directly linked to management actions on the refuge, and reserve harvests within limited blocks of timber on the refuge, and is expected to be very limited due to availability of resources outside the refuge. As future developments diminish resources outside the refuge, the demand for utilization of refuge resources is expected to increase. This is not an economic use, rather an alternative to refuge funded cleanup following timber management activities.

Where would the use be conducted?

Firewood cutting would be conducted in hardwood forests throughout the refuge following commercial harvest or thinning operations as designated by the Habitat Management Plan.

When would the use be conducted?

This activity would take place only when ground conditions exist that would limit disturbance and damage to the refuge.

How would the use be conducted?

Individuals would apply for a Special Use Permit for the collection of a limited amount of firewood for personal use to be harvested from selected areas on the refuge. Individuals are responsible for their equipment, safety, and all aspects of the removal of firewood from the refuge.

Why is this use being proposed?

Firewood cutting is a management tool to remove slash left by timber cutting operations, thereby reducing fuel loads associated with timber harvests. Removal of slash accelerates the response of shade-intolerant oak seedlings for which management is directed in the Habitat Management Plan. While this opportunity exists outside the refuge, it is seen as an alternative to refuge funded cleanup following approved timber sales.

**Availability of Resources:**

Resources involved in the administration and management of the use:

Administration and management are discussed in the Habitat Management Plan. Administrative costs are expected to be less than those associated with refuge cleanup on treatment areas. Permit application and issuance: \$25/permit.

Special equipment, facilities, or improvements necessary to support the use: None

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Maintenance costs:

Signing designated access routes and harvest areas: \$200/unit

Signs: \$125 (these signs would be utilized on multiple units for several years, and considered a one-time cost)

Monitoring costs:

As this use is considered to be an accompanying use to commercial timber harvest activities on the refuge, all monitoring activities would be attributable to those commercial activities, as covered in the Habitat Management Plan.

Offsetting revenues: None

**Anticipated Impacts of the Use:**

Short-term impacts:

No negative short-term impacts are expected. Firewood cutting occurs immediately after contractor has vacated a harvest compartment so no new disturbance of plants or wildlife would occur. Removal of debris and trees accelerates opening of the forest floor for oak regeneration, as well as reducing potential fuel loads within the harvest compartment. Permits set specific conditions and locations to minimize impacts.

Long-term impacts:

This activity would potentially provide positive long-term impacts through the accelerated release of hardwood species, thus creating diverse vertical structure within the management unit, as well as reducing ground litter and debris often associated with managed timber harvests.

Cumulative:

No cumulative impacts are anticipated.

**Public Review and Comment:**

This compatibility determination is provided for public review and comment during the Draft Comprehensive Conservation Plan comment period.

**Determination (check one below):**

Use is Not Compatible.

Use is Compatible with Following Stipulations

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**Stipulations Necessary to Ensure Compatibility:**

Firewood cutting is administered by refuge personnel through Special Use Permits and is allowed in designated areas only. Failure to meet the conditions of the Special Use Permit constitutes a violation of the Refuge Administration Act, whereby the permittee is subject to termination of the permit and issuance of a Notice of Violation.

**Justification:**

Personal firewood cutting is compatible with the purposes for which the refuge was established. It is an effective way to remove slash left by timber cutting operations and accelerates the growth of shade intolerant oak seedlings as directed in the Habitat Management Plan.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

- Categorical Exclusion without Environmental Action Statement
- Categorical Exclusion and Environmental Action Statement
- Environmental Assessment and Finding of No Significant Impact
- Environmental Impact Statement and Record of Decision

**Mandatory 10- or 15-Year Re-evaluation Date:**\_\_\_\_\_

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**Use:** Non-motorized Boating

**Description of Use:**

What is the use? Is the use a priority public use?

Non-motorized boating is a minor use occurring on the refuge. Although it is not a priority public use, it can be associated with several priority uses.

Where would the use be conducted?

Lower Hatchie Refuge is open to public use year-round except for areas that are designated as waterfowl sanctuary and the Sunk Lake PUNA, all of which are closed from November 15 through March 15. Much of the refuge is subject to flooding, which may result in parts or all of the refuge being closed for safety reasons.

When would the use be conducted?

The refuge is open to these activities year-round, except those portions of the refuge that are closed from November 15 through March 15.

How would the use be conducted?

Non-motorized boating is centered on wildlife viewing and fishing, which is conducted on open water and backwater sloughs that are open to such activity.

Why is this use being proposed?

Providing the public with wildlife-oriented recreation is one of the priority uses on the refuge. Non-motorized boating is a very popular activity in the surrounding area, and the refuge is one component in a complex of public lands in west Tennessee.

**Availability of Resources:**

Resources involved in the administration and management of the use:

Funding for this program is borne by annual operation and maintenance funds, which include activities involving the public, such as recreation, interpretation, environmental education, and hunting and fishing programs. The refuge spends approximately \$3,000 of an annual refuge budget of approximately \$300,000 in direct support of these programs on Lower Hatchie Refuge. Therefore, the program is in compliance with specific funding portions of the Refuge Recreation Act.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs:

Maintenance costs are not directly attributable to these incidental uses on the refuge.

Monitoring costs: None

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Offsetting revenues: None

**Anticipated Impacts of the Use:**

Short-term impacts:

Most of the impacts that could occur would involve some violation of refuge regulations, such as deliberate disturbance of wildlife or plants, littering, or vandalism. Disturbance to trust species during critical wintering periods is avoided by seasonal closure of sanctuary areas. Short-term impacts to facilities, such as roads and structures, can be avoided by special closures due to unsafe conditions.

Long-term impacts:

No long-term negative impacts are anticipated.

Cumulative:

No cumulative negative impacts are anticipated, however, programs could be modified in the future to mitigate unforeseen impacts.

**Public Review and Comment:**

This compatibility determination is provided for public review and comment during the Draft Comprehensive Conservation Plan comment period.

**Determination (check one below):**

Use is Not Compatible.

Use is Compatible with Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

Law enforcement patrolling of public use areas should continue to minimize violations. The current regulation that prohibits entry after daylight hours would be maintained. All seasonal closures are designed to coincide with peak waterfowl use periods. Any major change in waterfowl usage patterns that creates a conflict with public use would prompt further consideration of refuge regulations.

**Justification:**

A primary objective for which the refuge was established is to provide the public with wildlife- oriented recreational opportunities. Non-motorized boating is an activity that is compatible with the purpose for which the refuge was established.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

Categorical Exclusion without Environmental Action Statement

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Categorical Exclusion and Environmental Action Statement

Environmental Assessment and Finding of No Significant Impact

Environmental Impact Statement and Record of Decision

**Mandatory 10- or 15-Year Re-evaluation Date:** \_\_\_\_\_

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**Use:** Hiking, Jogging, and Walking

**Description of Use:**

What is the use? Is the use a priority public use?

Hiking, jogging, and walking activities are minor uses that occur on the refuge. Although they are not priority public uses, they can be associated with several priority uses.

Where would the use be conducted?

Lower Hatchie Refuge is open to public use year-round except for areas that are designated as waterfowl sanctuary and the Sunk Lake PUNA, all of which are closed from November 15 through March 15. Much of the refuge is subject to flooding, which may result in parts or all of the refuge being closed for safety reasons.

When would the use be conducted?

The refuge is open to these activities year-round, except those portions of the refuge that are closed from November 15 through March 15.

How would the use be conducted?

Most of the recreational activities on the refuge are centered on wildlife viewing, which is conducted on refuge roads and at the observation tower. Hiking, jogging, and walking occur on refuge roads or trails and areas that are open to such activities.

Why is this use being proposed?

Providing the public with wildlife oriented recreation is one of the priority uses on the refuge. Hiking, jogging, and walking are very popular activities in the surrounding area, and the refuge is one component in a complex of public lands in west Tennessee.

**Availability of Resources:**

Resources involved in the administration and management of the use:

Funding for these programs is borne by annual operation and maintenance funds, which include activities involving the public such as recreation, interpretation, environmental education, and hunting and fishing programs. The refuge spends approximately \$3,000 of an annual budget of approximately \$300,000 in direct support of these programs on Lower Hatchie Refuge. Therefore, the program is in compliance with specific funding portions of the Refuge Recreation Act.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs:

Maintenance costs are not directly attributable to these incidental uses on the refuge.

Monitoring costs: None

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Offsetting revenues: None

**Anticipated Impacts of the Use:**

Short-term impacts:

Most of the impacts that could occur would involve some violation of refuge regulations, such as deliberate disturbance of wildlife or plants, littering, or vandalism. Disturbance to trust species during critical wintering periods is avoided by seasonal closure of sanctuary areas. Short-term impacts to facilities, such as roads and structures, can be avoided by special closures due to unsafe conditions.

Long-term impacts:

No long-term negative impacts are anticipated.

Cumulative:

No cumulative negative impacts are anticipated, however, programs may be modified in the future to mitigate unforeseen impacts.

**Public Review and Comment:**

This compatibility determination is provided for public review and comment during the Draft Comprehensive Conservation Plan comment period.

**Determination (check one below):**

Use is Not Compatible.

Use is Compatible with Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

Law enforcement patrolling of public use areas should continue to minimize violations. The current regulation that prohibits entry after daylight hours would be maintained. All seasonal closures are designed to coincide with peak waterfowl use periods. Any major change in waterfowl usage patterns that creates a conflict with public use would prompt further consideration of refuge regulations.

**Justification:**

A primary objective for which the refuge was established is to provide the public with wildlife-oriented recreational opportunities. Jogging, walking, and hiking at the refuge are activities that are compatible with that purpose for which the refuge was established.

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**Use:** Horseback Riding

**Description of Use:**

What is the use? Is the use a priority public use?

Horseback riding on established roads within Lower Hatchie Refuge. While not one of the six priority public uses, it is often associated with them.

Where would the use be conducted?

Horseback riding would be permitted on refuge roads open to the public for vehicle traffic.

When would the use be conducted?

Horseback riding would be permitted year-round during daylight hours only, on roads open to vehicular traffic. Areas closed to the general public for management or safety purposes would be closed to horseback riding as well.

How would the use be conducted?

Horseback riding would be a self-initiated activity on the refuge, with no amenities provided specifically for this activity. Participants of this activity would be responsible for all aspects of their visit and use of the refuge.

Why is this use being proposed?

This is a popular activity, which has historically occurred on lands that are now refuge lands within west Tennessee. Development and paving of most of the roads in west Tennessee have significantly decreased the amount of gravel roads available for horseback riding.

**Availability of Resources:**

Resources involved in the administration and management of the use: No additional administrative costs are associated with this activity.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: None

Monitoring costs: None

Offsetting revenues: None

**Anticipated Impacts of the Use:**

Short-term impacts: Negative impacts are expected to be severe on under-developed hiking trails on the refuge. These impacts include trampling of vegetation, hoof damage during wet periods, and potential browse damage adjacent to trails.

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Long-term impacts: There could be increased long-term maintenance costs associated with rehabilitation of damaged foot trails.

Cumulative impacts: No cumulative impacts are expected.

**Determination (check one below):**

Use is Not Compatible

Use is Compatible with Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

Horseback riding would be limited to daylight hours only. Horseback riding would be restricted to graveled public roads open to vehicle traffic.

**Justification:**

Horseback riding supports wildlife observation by providing an alternative mode of travel on refuge roads.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

Categorical Exclusion without Environmental Action Statement

Categorical Exclusion and Environmental Action Statement

Environmental Assessment and Finding of No Significant Impact

Environmental Impact Statement and Record of Decision

**Mandatory 10- or 15-Year Re-evaluation Date:**\_\_\_\_\_

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**Use:** Bicycling

**Description of Use:**

What is the use? Is the use a priority public use?

Bicycling is a minor use occurring on the refuge. Although it is not a priority public use, it can be associated with several priority uses.

Where would the use be conducted?

Lower Hatchie Refuge is open to public use all year except for areas that are designated as waterfowl sanctuary and the Sunk Lake PUNA, all of which are closed from November 15 through March 15. Much of the refuge is subject to flooding, which may result in parts or all of the refuge being closed for safety reasons.

When would the use be conducted?

The refuge is open to these activities year-round, except those portions of the refuge that are closed from November 15 through March 15.

How would the use be conducted?

Bicycling is centered on wildlife viewing. It occurs on refuge roads or trails and areas that are open to such activity.

Why is this use being proposed?

Providing the public with wildlife-oriented recreation is one of the priority uses on the refuge. Bicycling is a very popular activity in the surrounding area, and the refuge is one component in a complex of public lands in west Tennessee.

**Availability of Resources:**

Resources involved in the administration and management of the use:

Funding for these programs is borne by annual operation and maintenance funds, which include activities involving the public, such as recreation, interpretation, environmental education, and hunting and fishing programs. The refuge spends approximately \$3,000 of an annual refuge budget of approximately \$300,000 in direct support of these programs on Lower Hatchie Refuge. Therefore, the program is in compliance with specific funding portions of the Refuge Recreation Act.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs:

Maintenance costs are not directly attributable to these incidental uses on the refuge.

Monitoring costs: None

Offsetting revenues: None

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**Anticipated Impacts of the Use:**

Short-term impacts:

Most of the impacts that could occur would involve some violation of refuge regulations, such as deliberate disturbance of wildlife or plants, littering, or vandalism. Disturbance to trust species during critical wintering periods is avoided by seasonal closure of sanctuary areas. Short-term impacts to facilities, such as roads and structures, can be avoided by special closures due to unsafe conditions.

Long-term impacts:

No long-term negative impacts are anticipated.

Cumulative:

No cumulative negative impacts are anticipated, however, programs may be modified in the future to mitigate unforeseen impacts.

**Public Review and Comment:**

This compatibility determination is provided for public review and comment during the Draft Comprehensive Conservation Plan comment period.

**Determination (check one below):**

Use is Not Compatible.

Use is Compatible with Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

Law enforcement patrolling of public use areas should continue to minimize violations. The current regulation that prohibits entry after daylight hours would be maintained. All seasonal closures are designed to coincide with peak waterfowl use periods. Any major change in waterfowl usage patterns that creates a conflict with public use would prompt further consideration of refuge regulations.

**Justification:**

A primary objective, for which the refuge was established, is to provide the public with wildlife oriented recreational opportunities. Bicycling at the refuge is an activity that is compatible with the refuge purpose.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

Categorical Exclusion without Environmental Action Statement

Categorical Exclusion and Environmental Action Statement

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Environmental Assessment and Finding of No Significant Impact

Environmental Impact Statement and Record of Decision

**Mandatory 10- or 15-Year Re-evaluation Date:** \_\_\_\_\_

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**Use:** Off-Road Vehicles (handicapped use only)

**Description of Use:**

What is the use? Is the use a priority public use?

Use of off-road vehicles (4-wheel all-terrain vehicles) by disabled hunters is essential in providing adequate hunting opportunities for these individuals. The difficult and often swampy terrain on the refuge makes individual use of all-terrain vehicles (ATVs) the most cost-effective method of providing access for disabled hunters. Use is restricted to transportation to and from designated hunting locations, including the transport of personal gear and game taken by the handicapped hunter. Carrying another person or their game is not permitted.

Where would the use be conducted?

This use would be allowed in designated areas open to hunting on the refuge.

When would the use be conducted?

Use is only allowed during established refuge hunting seasons.

How would the use be conducted?

Access by disabled hunters is allowed on a case-by-case basis, with applicants providing necessary documentation of disability, request for areas to be accessed, and species sought. Currently, the refuge receives 3 to 5 requests annually for Special Use Permits from disabled hunters, primarily seeking access for deer hunting. The hunters are responsible for providing all equipment and associated assistance during their hunts. The permit grants no other privileges other than access by ATV on designated trails within the refuge, and the permittee must comply with all other refuge and State hunting regulations.

Why is this use being proposed?

Disabled hunters routinely apply for a Special Use Permit to participate in hunting programs offered on the refuge. While these opportunities currently exist on private lands and State wildlife management areas, the refuge has an obligation to provide access to disabled hunters.

**Availability of Resources:**

Resources involved in the administration and management of the use:

Review and issuance of special use permits: \$50/permit

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs:

Several existing trails would be utilized by disabled hunters. These trails are currently maintained to support other recreational activities, so no additional costs would be attributable to this program.

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Monitoring costs:

All monitoring of this use would be conducted in conjunction with the refuge hunting program, and no additional costs would be attributed to this program.

Offsetting revenues: None

**Anticipated Impacts of the Use:**

Short-term impacts:

Impacts to wildlife, plants, and habitat by ATVs are well documented and some disturbance to wildlife, plants, and their habitats is expected to occur. The impacts to the refuge are considered minor and are acceptable in providing suitable access to disabled hunters.

Long-term impacts:

No long-term impacts are expected due to the short duration and limited scope of the anticipated use.

Cumulative:

No cumulative impacts are anticipated with this use.

**Public Review and Comment:**

This compatibility determination is provided for public review and comment during the Draft Comprehensive Conservation Plan comment period.

**Determination (check one below):**

Use is Not Compatible.

Use is Compatible with Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

The refuge has established a policy for the level of disability that necessitates the use of off-road vehicles for hunting. Persons applying for disabled hunter status must possess written proof of disability from their physician, which is reviewed prior to issuance of a Special Use Permit. All other refuge regulations apply.

**Justification:**

A primary objective for which the refuge was established is to provide the public with wildlife-oriented recreation. Allowing handicapped hunters to use off-road vehicles to pursue their sport provides this group with no more opportunity than that afforded the general public. Provided this activity adheres to refuge regulations, it is compatible with refuge objectives.

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**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

Categorical Exclusion without Environmental Action Statement

Categorical Exclusion and Environmental Action Statement

Environmental Assessment and Finding of No Significant Impact

Environmental Impact Statement and Record of Decision

**Mandatory 10- or 15-Year Re-evaluation Date:** \_\_\_\_\_

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**Use:** Forest Management

**Description of Use:**

What is the use? Is the use a priority public use?

The forest management objectives for the refuge are: 1) Maintain and enhance necessary habitat for threatened and endangered species by promoting plant communities beneficial to these species. 2) Manage forest stands to enhance waterfowl habitat by manipulating stand composition in order to produce high-quality food and to provide adequate nesting areas. This will include promoting red oak and other favored tree species and by assuring that adequate den and snag trees remain in the stands. 3) Manipulate forest stands to provide diverse habitat for a wide variety of wildlife species present throughout the refuge by providing a variety of plant successional stages ranging from regeneration to mature timber. 4) Perform management actions that will compliment recreational and educational activities, by carefully planning when and where management actions should take place. 5) Utilize management techniques that do not adversely affect soils, water bodies, or any other natural resources present. These techniques should include harvesting under proper climatic conditions and placing buffer strips, where necessary, to protect water quality or other natural resources.

Various silvicultural treatments will be used to accomplish these forest management objectives. Silvicultural decisions will be based upon the favored wildlife species and their habitat requirements as they relate to the favored tree species as outlined in the Habitat Management Plan. The refuge's goal is to promote the favored trees species that will meet the wildlife habitat requirements. The refuge must recognize the importance of these tree species and the special management considerations necessary in order to assure that they remain a high percentage of the stand composition. Silvicultural decisions should consider the age and vigor of the existing stands and the availability of desirable reproduction. When harvesting timber, management will be concerned with the promotion of diverse, vigorous stands of timber, which benefit trust species. An important factor to consider when making silvicultural decisions is the availability of advanced red oak regeneration.

After reviewing the data collected and surveying the refuge, there is a great concern about the future of red oak species on the refuge. Much of the staff's time will be spent making timber cuts to aid the red oak reproduction and to promote it to an advanced stage so that it can be released. During the initial survey of the refuge, extensive data were collected concerning reproduction. These areas will receive high-priority management attention. It is crucial that this reproduction be released to promote the growth of new stands with a relatively high red oak component. Various silvicultural treatments will be used to promote favored timber species. These treatments include intermediate cuttings, timber stand improvement, shelterwood, clearcut, and patch cuts.

Where would the use be conducted?

Lower Hatchie Refuge currently consists of 9,451 acres of which 5,000+ acres contain bottomland hardwoods in the lower reaches of the Hatchie River. The refuge is important because it lies at the confluence of the Hatchie and Mississippi Rivers and contains ecotypes that support many wetland-dependent species.

When would the use be conducted?

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Activities would be conducted during the driest months of the year, usually July through November.

How would the use be conducted?

Timber harvest operations would be conducted using local contractors who would bid on the timber to be harvested. Timber stand improvements would be conducted by the staff using a dozer with shearing blade or chemical injection of undesirable species.

Why is this use being proposed?

This use is being proposed by the refuge as a management tool designed to improve habitat conditions on the refuge for trust species.

**Availability of Resources:**

Resources involved in the administration and management of the use:

Complex forestry staff would spend an estimated 35 percent of their time at Lower Hatchie Refuge. The Habitat Management Plan goes into sufficient detail regarding station resources needed to accomplish forest management activities.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs:

All maintenance activities associated with commercial timber harvest would be carried out by the contractor. While this would reduce the payment to the Federal Government for the value of timber removed, no additional costs would be incurred by the refuge.

Monitoring costs:

Monitoring of timber sales is an administrative function and all costs associated with this activity are previously accounted for.

Offsetting revenues: None

**Anticipated Impacts of the Use:**

Short-term impacts:

Short-term impacts would vary with the scope of the timber harvest technique utilized. Thinning and timber stand improvement projects would result in very limited impacts to habitats, and virtually no impacts to trust species. Clearcuts and patch cutting would have moderate impacts to localized blocks of habitats, and may temporarily displace trust species.

Long-term impacts:

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Long term impacts would be beneficial for all timber harvest operations, as these operations are designed to improve habitat conditions over time for trust species. Benefits include, but are not limited to, increased vigor of key species, increased diversity both in structure and species composition of the forest habitats, and improved wildlife habitat.

Cumulative:

No negative cumulative impacts are expected as a result of forest management. Forest management, in concert with other refuge management activities, would greatly enhance the suitability of the various habitats on the refuge for a variety of wildlife species.

**Public Review and Comment:**

This compatibility determination is provided for public review and comment during the Draft Comprehensive Conservation Plan comment period.

**Determination (check one below):**

Use is Not Compatible.

Use is Compatible with Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

All commercial activities would be conducted under the regulations set forth by Special Use Permits. These regulations would follow all guidelines outlined in the Habitat Management Plan. Forest management activities would follow the Tennessee Forest Best Management Practices.

**Justification:**

The forest management program is compatible with the purposes for which the refuge was established and is in compliance with the National Wildlife Refuge System Act, the Refuge Recreation Act, and the Refuge Improvement Act of 1997. The activities of the forest management program also support the following plans: Partners-in-Flight, Lower Mississippi Joint Venture, and the West Tennessee Wildlife Resource Conservation Plan.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

Categorical Exclusion without Environmental Action Statement

Categorical Exclusion and Environmental Action Statement

Environmental Assessment and Finding of No Significant Impact

Environmental Impact Statement and Record of Decision

**Mandatory 10- or 15-Year Re-evaluation Date:** \_\_\_\_\_

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**Use:** Resource Research Studies

**Description of Use:**

What is the use? Is the use a priority public use?

This activity would allow university students and professors, non-governmental researchers, and governmental scientists access to the refuge's natural environment to conduct both short-term and long-term research projects. The outcome of this research would result in better knowledge of our natural resources and improved methods to manage, monitor, and protect the refuge resources.

Where would the use be conducted?

This activity would be conducted throughout the refuge in a variety of habitat types. Activities carried out during approved research projects may be limited to avoid unnecessary disturbance to refuge resources.

When would the use be conducted?

These activities would vary in scope and duration, as needed, to satisfy the requirements of the research project. Projects may involve everything from limited one-time sampling to long-term study plots.

How would the use be conducted?

Research projects would be conducted by accredited universities, state and federal governmental representatives, and rarely by private individuals. The refuge would act solely in a supportive role, providing minimal assistance in most cases.

Why is this use being proposed?

Furthering the knowledge of the impacts and benefits of management decisions, life histories of wildlife species utilizing the refuge, and interrelationships of habitats and wildlife occurring on the refuge is crucial to the effective management of the refuge. The refuge provides secure sites for long-term evaluation of management actions, population trends, and ecological functions within the bottomland ecosystems in west Tennessee.

**Availability of Resources:**

Resources involved in the administration and management of the use:

No additional fiscal resources are needed to conduct this use. Existing staff can administer Special Use Permits and monitor use as part of routine management duties.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: None

Monitoring costs: None

Offsetting revenues: None

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**Anticipated Impacts of the Use:**

Short-term impacts:

There should be no significant negative impacts from scientific research on the refuge. The knowledge gained from the research would provide information to improve management techniques and better meet the needs of trust resource species. Impacts, such as trampling of vegetation and temporary disturbance to wildlife, would occur but should not be significant. A small number of individual plants and animals may be collected for further study. These collections would have an insignificant effect on the refuge plant and animal populations.

Long-term impacts:

Long-term benefits associated with improved management techniques developed through research would far outweigh any negative impacts that may occur.

Cumulative:

No negative cumulative effects are anticipated.

**Public Review and Comment:**

This compatibility determination is provided for public review and comment during the Draft Comprehensive Conservation Plan comment period.

**Determination (check one below):**

Use is Not Compatible.

Use is Compatible with Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

Each request for use of the refuge for research would be examined on its individual merit. Questions of who, what, when, where, and why, would be asked to determine if requested research contributed to the refuge purposes and could best be conducted on the refuge without significantly affecting the resources. If so, the researcher would be issued a Special Use Permit. Progress would be monitored and the researcher would be required to submit annual progress reports and copies of all publications derived from the research.

**Justification:**

The benefits derived from sound research provide a better understanding of species and the environmental communities present on the refuge. These benefits far outweigh any short-term disturbance or loss of individual plant and animals that might occur.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

- 
- Categorical Exclusion without Environmental Action Statement
  - Categorical Exclusion and Environmental Action Statement
  - Environmental Assessment and Finding of No Significant Impact
  - Environmental Impact Statement and Record of Decision

**Mandatory 10- or 15-Year Re-evaluation Date:** \_\_\_\_\_



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# *Appendix VI. Management Methods and Procedures*

## **PARTNERSHIPS**

The Service's Partners for Fish and Wildlife program helps accomplish its mission by offering technical and financial assistance to private landowners to voluntarily restore wetlands and other fish and wildlife habitats on their land. The program emphasizes the reestablishment of native vegetation and ecological communities for the benefit of fish and wildlife in concert with the needs and desires of private landowners.

The Service also enlists the assistance of a wide variety of other partners to help restore wildlife habitat on private lands. These partners include other Federal agencies, Tribes, State and local governments, conservation organizations, academic institutions, industries and other businesses, school groups, and private individuals. While not a program requirement, a dollar-for-dollar cost-share is usually sought on a project-by-project basis.

Since the project's inception in 1987, these partnerships have generated significant habitat restoration accomplishments on private lands, primarily focused on the restoration of wetlands, native grasslands, stream banks, riparian areas, and in-stream aquatic habitats. These restored habitats now provide important food, water, and cover for Federal trust species, including migratory birds (e.g., waterfowl, shore and wading birds, songbirds, and birds of prey), anadromous fish, and threatened and endangered species, as well as other fish, wildlife, and plant species that have experienced population declines in the recent past. Many of these projects are located near existing National Wildlife Refuge System lands or State Wildlife Management Areas, providing increased benefits to fish and wildlife that rely on these lands for survival.

The assistance that the Service offers to private landowners may take the form of informal advice on the design and location of potential restoration projects, or it may consist of designing and funding restoration projects under a voluntary cooperative agreement with the landowner. Under the cooperative agreements, the landowner agrees to maintain the restoration project as specified in the agreement for a minimum of 10 years.

Typical restoration projects may include, but are not limited to:

- Restoring wetland hydrology by plugging drainage ditches, breaking tile drainage systems, installing water control structures, constructing levees, and reestablishing old connections with waterways.
- Installing fencing and off-stream livestock watering facilities to allow for restoration of stream and riparian areas.
- Removal of exotic plants and animals that compete with native fish and wildlife and alter their natural habitats.
- Prescribed burning as a method of removing exotic species and restoring natural disturbance regimes necessary for some species survival.
- Reconstruction of in-stream aquatic habitat through bioengineering techniques.

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In addition to providing restoration assistance to private landowners, the Service also provides biological technical assistance to U.S. Department of Agriculture agencies implementing key conservation programs of the Farm Bill. The Service's assistance helps the Department of Agriculture meet the technical challenges presented by these programs while maximizing benefits to fish and wildlife resources. The Service also assists in on-the-ground habitat restoration actions associated with several of these programs.

Under the Wetlands Reserve Program, conservation easements are required to protect and restore formerly degraded agricultural wetlands. The Service provides technical assistance to Department of Agriculture agencies and to private landowners on site selection, restoration planning, and compatible uses for easements offered voluntarily by interested landowners.

## **AVIFAUNAL ANALYSIS**

### ***WINTERING WATERFOWL***

The North American Waterfowl Management Plan (NAWMP) identified a continental waterfowl population goal of 62 million breeding ducks, goals for specific populations of geese, and the actions needed to achieve those goals. The NAWMP identified the Lower Mississippi Valley (LMV) as one of the priority habitat areas, and a plan of action for the LMV was implemented in 1990 to achieve NAWMP goals. The goal of the LMV Plan focused on providing an adequate quantity, quality, and distribution of habitats on public and private lands to ensure that the LMV could support a wintering population of at least 8.7 million ducks and 1.4 million geese. The geographic area covered by the West Tennessee Wildlife Resources Conservation Plan (WTWR Conservation Plan) needs to provide an adequate quantity, quality, and distribution of habitats to support a wintering population of 599,000 ducks and 61,000 Canada geese. Achieving this goal will require maintaining the current 10,600 acres managed in west Tennessee for ducks and geese and developing a minimum of 6,300 additional acres of habitat with water management capability for ducks.

The WTWR Conservation Plan identified minimum waterfowl foraging objectives for the Obion, Forked Deer, and Hatchie/Wolf River Watersheds, along with strategies and actions designed to meet those needs. It should be recognized that providing adequate foraging habitats to support duck population objectives depends upon current habitat conditions and food availability, which vary annually. In some years, food resources will be abundant and readily available, but much less in other years. Therefore, management efforts should focus, at a minimum, on meeting foraging needs during critical periods. It was assumed that if adequate foraging habitats are available, other habitat types needed by waterfowl will also be adequate. Other life history needs related to sanctuary, water, cover, molting, pairing, etc., will be considered throughout the planning area as well as species specific requirements such as nest and brood habitat for wood ducks.

Duck population and habitat carrying capacity goals for the WTWR Conservation Plan were stepped down from the Lower Mississippi Valley Joint Venture Plan (Loesch et al., 1994), which was developed to implement the NAWMP. Duck population goals were calculated using data from the Midwinter Waterfowl Inventory, county duck harvest estimates, and continental population goals. This method involves calculating the number of ducks that must winter in the WTWR Conservation Plan area if the NAWMP is to achieve the 62 million average continental breeding population objective. The steps involved in making these calculations were described in the Lower Mississippi River Joint Venture Evaluation Plan. Other documents that provided guidance in formulating goals and objectives for the WTWR Conservation Plan were the Tennessee Wildlife Resources Strategic Plan for 2000-2006 and the Tennessee Implementation Plan for the NAWMP.

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Guidelines from the WTWR Conservation Plan used in this CCP included:

- The average number of geese counted during the January Mid-Winter Waterfowl Survey for the period 1985-1989 was selected as the population goal for the WTWR Conservation Plan.
- Procedures used to calculate waterfowl objectives in the LMV (Loesch et al., 1994) were also used for the WTWR Conservation Plan. However, since calculated foraging objectives are considered to be the minimum needed and the TWRA's Strategic Plan calls for a 15 percent increase in populations and habitat, objectives were increased by 15 percent.

Under existing management, Lower Hatchie Refuge provides 475 acres of managed impoundments, 375 of which are flooded. In addition, 185 acres of winter wheat or corn are planted annually on agricultural lands that surround the impoundments. According to objectives and strategies developed as part of the WTWR Conservation Plan, Lower Hatchie Refuge has target objectives of 5.1 million duck-use-days and 500,000 goose-use-days.

### ***TRANSIENT SHOREBIRDS***

Habitat objectives (acres) derived from shorebird population estimates have been developed by the Mississippi Alluvial Valley Migratory Bird Initiative (MBI) and adopted by the U.S. Shorebird Conservation Plan (USSCP). Whereas these acre objectives are useful in shorebird management, it is generally recognized that intensive management of smaller basins likely results in consistently greater carrying capacity for shorebirds than does less intensive management on extensive areas (Rohs, Short, 1999; USSCP, 2000). This results mainly from the fact that optimal habitat conditions for shorebirds occupy a relatively narrow band in the water depth and vegetation density continuums. Providing mudflat/shallow water (i.e.  $\leq 2$  in. water) conditions with less than 25 percent vegetative cover over extensive areas is difficult under most management situations in west Tennessee, especially during the fall. As a result, the approach in developing the WTWR Conservation Plan is not only to identify areas potentially suitable for shorebird habitat management (i.e., acquisition and protection), but also to provide information necessary to manage effectively for shorebirds on existing and potential management areas. Note that this is in contrast to an approach of taking the existing acreage objective and stepping it down to various specific management units (WMAs and refuges).

Stopover habitat during southward migration has been identified by the U.S. Shorebird Conservation Plan as the critical factor for shorebird habitat management in the LMV region. Quality habitat for shorebirds during this portion of the annual cycle consists of shallow (0-2 in.) water with little standing vegetation (< 25 percent cover) from late July through October. Because this typically is a dry time of year in west Tennessee, sites that naturally hold water (i.e., low-lying sites with poorly drained, hydric soils) likely offer the most favorable conditions for effective wetland restoration and management.

Current public land habitat objectives for shorebirds in the MAV of Tennessee total 224 acres, whereas planned shorebird habitat acres total 230. In 1999, publicly managed areas within the MAV in west Tennessee provided 97 acres of habitat in the fall specifically for shorebirds (LMV Joint Venture Office, unpubl. data). Shorebird habitat goals for TWRA in fall 2000 for Eagle Lake, White Lake, and Reelfoot WMA were 90, 120, and 80, respectively, totaling 290 acres. This would have provided well over half of the MBI objective (457 acres). However, due to excessively dry conditions, these goals were not met. If properly managed, a small percentage of the areas identified as potentially suitable for shorebird habitat management in the WTWR Conservation Plan, plus the objective acreage on existing TWRA areas, would more than satisfy the MBI shorebird habitat objective for Tennessee.

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Shorebird habitat is largely compatible with waterfowl habitat. Perhaps the most substantial difference between shorebird and waterfowl habitat management is the timing of prescribed actions. Fall shorebird migration occurs earlier than migration for most waterfowl species. However, managing for early fall migratory shorebirds will provide optimal habitat for southward-migrating blue-winged teal. Basins drawn down in late summer for shorebird habitat can be reflooded in November, making seeds in the substrate available to waterfowl. Additionally, shallow water habitat during late summer/early fall is beneficial to many species of wading birds, including herons, egrets, and bitterns.

Waterfowl and shorebirds also differ somewhat in their use of water depth. Generally, dabbling ducks use a wider range of water depths than shorebirds. Hence, maintaining shallow water (< 6 inches) accommodates both shorebirds and dabbling ducks, whereas deeper water (8-12 inches) excludes most of the shorebird species common to this region. Likewise, ducks tolerate a greater density of standing vegetation than shorebirds. Fortunately, reducing standing vegetation by disking in late summer/fall enhances benthic invertebrate density, creates conditions suitable for shorebird use, and can increase seed density for waterfowl in the subsequent growing season (Gray et al., 1999). However, note that disking or mowing prior to October (as is recommended for some fall shorebird habitat scenarios) will reduce seed production by late-seeding grasses, such as millet and panic grasses, which are heavily utilized by waterfowl. Managing multiple units under a variety of regimes will ensure that such loss of potential waterfowl food occurs on only a few units ( $\leq 2$ ) in a given year.

Under existing management on Lower Hatchie Refuge, approximately 150 acres are managed during the spring shorebird migration period, and approximately 100 acres are provided during the fall migration period. Under the WTWR Conservation Plan, plans for Lower Hatchie Refuge should include the development of 100 acres of habitat to contribute toward MAV shorebird habitat objectives.

### ***FOREST BREEDING BIRDS***

Habitat objectives for land birds in the MAV have been established by Partners-in-Flight in the Mississippi Alluvial Valley Bird Conservation Plan (Twedt et al., 1998). Swallow-tailed kite restoration, stable or increasing cerulean warbler populations, and stable or increasing Swainson's warbler populations are the primary land bird goals in the MAV Bird Conservation Plan. In order to meet the population objectives for these species, the Plan has identified 87 Bird Conservation Areas, broken down into fifty-two 10,000-to-20,000-acre blocks, thirty-six 20,000-to-100,000-acre blocks, and thirteen blocks of over 100,000 acres each, as MAV Bird Conservation Areas, were identified by Ford (1998).

Bottomland hardwoods have been identified as the habitat of primary concern in the MAV, with at least 70 species of land birds occurring in this habitat type in the physiographic area (Twedt et al., 1998). The highest priority land birds species in the MAV include Swainson's warbler, cerulean warbler, and swallow-tailed kite, all of which occur in bottomland hardwood forests.

In the MAV in Tennessee, there are currently 70,475 acres of bottomland hardwoods currently under some kind of conservation protection that benefits land birds. The majority of these acres are in public ownership. An additional 6,964 acres of bottomland hardwoods are planned for future conservation actions, and an additional 89,941 acres of bottomland hardwoods are desired for future conservation action in order to attain target objectives for land birds in the MAV of Tennessee (TWRA and USFWS 2002). These conservation activities have been further refined into implementation zones.

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Migratory bird habitat objectives are segregated by implementation zones, and the “middle implementation zone” for the West Tennessee MAV is shown in Figure 5. The middle implementation zone includes Moss Island Wildlife Management Area and extends south to encompass Lower Hatchie Refuge. The total acreage is 165,472 acres. Currently, 46,328 acres are under migratory bird management, with an additional 2,627 acres planned or under development. An additional 57,631 acres are necessary to meet migratory bird habitat objectives in this zone. These acreage figures reflect actual migratory bird habitat; the total acreage is higher to include open water, buildings, and other miscellaneous land uses. The necessary future condition for migratory land birds will require bottomland hardwood forests, dry scrub/shrub, and managed grasslands.

A primary focus for the middle implementation zone should be the acquisition of core forested areas, such as the John T. Tully Wildlife Management Area (formerly the Anderson-Tully property) in Lauderdale County, acquired by Tennessee Wildlife Resources Agency in 2002. This property is comprised of 11,500 acres of mature bottomland hardwood forest, and serves as a core area for high-priority interior forest neotropical migratory birds, such as the cerulean warbler and Swainson’s warbler. In addition to the acquisition of the Tully property, forested blocks are proposed to be increased at Moss Island Wildlife Management Area, and Chickasaw and Lower Hatchie Refuges. Habitat corridors, primarily on or near the bluffs, are also proposed to connect forested tracts.

Under existing management, Lower Hatchie Refuge provides approximately 5,852 managed acres of bottomland hardwood forest for land birds and approximately 1,000 acres of upland forest. Under WTWR Conservation Plan goals and objectives, Lower Hatchie Refuge should target an additional 10,375 forested acres.

### ***THREATENED AND ENDANGERED BIRD SPECIES***

Part of the Service mission is to protect, enhance, and manage habitat for threatened and endangered species, in keeping with the enforcement of the Endangered Species Act. Two federally listed bird species known to use the Lower Hatchie Refuge vicinity during at least part of their life cycle include the bald eagle and the interior least tern.

The bald eagle, a threatened species that the Service plans to de-list, winters in the Mississippi Alluvial Valley of Tennessee in large numbers. Nearby Reelfoot Lake has one of the largest overwintering populations in the lower 48 states. As many as 10 bald eagles have been known to occur in the Lower Hatchie Refuge vicinity, but no active nests are known to exist on the refuge. While there has yet to be a documented nest on the refuge, the refuge’s continuing habitat restoration and protection activities provide suitable habitat for nesting eagles.

The interior least tern population is an endangered species, which has a number of active nesting colonies on sandbars within the Mississippi River adjacent to Tennessee. There is a known active nesting colony on a Mississippi River sandbar approximately 1.5 miles south of the refuge, and interior least terns have also been observed resting and feeding on refuge lands at the mouth of the Hatchie River, although no nesting colony exists at that location. The refuge’s protection of lands immediately adjacent to the Mississippi River includes protection of sand bars where least tern nesting colonies exist during summer months.

A Section 7 Intra-Service Biological Evaluation addressing those species is found in Appendix V.

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## **ARCHAEOLOGICAL AND HISTORIC RESOURCE PROTECTION**

With the enactment of the Antiquities Act of 1906, the Federal Government recognized the importance of cultural resources to the national identity and sought to protect archaeological sites and historic structures on those lands owned, managed, or controlled by the United States.

The body of historic preservation laws has grown dramatically since 1906. Several themes are consistently present in the laws and the establishing regulations. They include: 1) each agency to systematically inventory the “historic sites” on its holdings and to scientifically assess each site’s eligibility for the National Register of Historic Places; 2) consideration of impacts to cultural resources during the agency’s management activities and seeking to avoid or mitigate adverse impacts; 3) protection of cultural resources from looting and vandalism to be accomplished through a mix of informed management, law enforcement efforts, and public education; and 4) the increasing role of consultation with groups, such as Native American tribes, to address how a project or management activity may impact specific archaeological sites and landscapes deemed important to those groups.

The objectives and strategies below outline the Service’s attempt to achieve mandated historic preservation responsibilities in a manner consistent with its mission and the refuge’s mission.

The Fish and Wildlife Service Regional Archaeologist coordinates a Memorandum of Understanding with pertinent Federal and State agencies, such as the Tennessee Wildlife Resources Agency, to enhance law enforcement of the Archaeological Resources Protection Act, the Native American Grave Protection and Repatriation Act, and Section 50 of the Code of Federal Regulations, as well as to facilitate investigations of Archaeological Resources Protection Act violations and unpermitted artifact collection on the refuge.

A review of the State Site files located at the Tennessee Department of Environment and Conservation Division of Archaeological Resources will provide preliminary information on known or potential archaeological sites and historic structures within or near the refuge. Such information will aid the Service in the development of a long-term management plan for cultural resources. A comprehensive refuge-wide archaeological survey is recommended so that the Service’s management options can be fully realized in a cost-effective manner. The survey will provide a site predictive model based upon the region’s cultural history, known site distribution, oral history interviews, historic documents, historic land use patterns, topography, geomorphology, soils, hydrology, and vegetative patterns.

## **ECOSYSTEM MANAGEMENT**

Ecosystems are communities of living organisms interacting among themselves and with the physical components of their environment. Ecosystems worldwide are experiencing increasing impacts from human activities, resulting in greater challenges to effective management and conservation. In recent years, conservationists have fostered the idea that resource conservation can best be achieved by taking a holistic approach to management. The ecosystem approach to fish and wildlife conservation means protecting or restoring the function, structure, and species composition of an ecosystem while providing for its sustainable socioeconomic use. It involves recognizing that, in some way, all things within the ecosystem are interconnected. As such, the Service is working with divergent interests on ecosystem-based approaches to conserve the variety of life and its processes in the Nation’s diverse ecosystems.

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The Service's mission is to conserve, protect, and enhance the Nation's fish and wildlife and their habitats for the continuing benefit of the American people. Healthy habitats are necessary to sustain fish, wildlife, and plants on lands in the National Wildlife Refuge System. In the past, the administrative boundaries of refuges have often bounded the scope of planning and policy decisions. The Service's objective in ecosystem management is to implement consistent policies and procedures that will embrace the larger "management environment," considering the needs of all resources in decision-making. This holistic approach to fish and wildlife conservation enables the Service to more efficiently and effectively maintain healthy ecosystems on a long-term basis and to conserve the Nation's rich biological heritage.

In the early 1990s, the Service adopted an ecosystem approach to resource management, identifying 53 separate ecosystems within the United States (USFWS 1994). Included in this group is the Lower Mississippi River Ecosystem, which encompasses the Lower Hatchie Refuge. The Lower Mississippi River Ecosystem Team, composed of Service personnel and partners with professional expertise in the Lower Mississippi River Valley, focuses on landscape-level problems affecting fish and wildlife resources and provides specific guidance that will best serve trust species and species of concern and reduce impacts associated with forest fragmentation. The ecosystem approach emphasizes conservation and management of discrete land units, watersheds, or ecosystems and requires the identification of ecosystem goals that represent resource priorities. On a more local level, the comprehensive conservation planning team reflects the conservation strategies for national wildlife refuges within the ecosystem and identifies strategies on which to focus management efforts. The Service must work closely and consistently with external partners, public and private, who share responsibility for ecosystem health and biological diversity. This approach enables the Service to fulfill its fish and wildlife trust responsibilities with greater efficiency and effectiveness. (See Chapter I of the Draft CCP for further discussion of specific ecosystem issues).

## **LAND PROTECTION AND CONSERVATION**

All Federal agencies by law have the power of eminent domain, which allows the use of condemnation to acquire lands and interests in lands for the public good. However, it is the policy of the Service to acquire lands from willing sellers only and only when other protective means, such as local zoning restrictions and regulations, are not appropriate, available, or effective.

The Service acquires lands and interests in lands, such as easements and management rights, through leases or cooperative agreements consistent with legislation or other congressional guidelines and executive orders, for the conservation of fish and wildlife and to provide wildlife-oriented public use for educational and recreational purposes. These lands include national wildlife refuges, national fish hatcheries, research facilities, and other areas.

When land is needed to achieve fish and wildlife conservation objectives, the Service seeks to acquire the minimum interest necessary to reach those objectives. If fee title is required, the Service gives full consideration to extended use reservations, exchanges, or other alternatives that will lessen the impact on the owner and the community. Donations of desired lands or interests are encouraged. In all fee title acquisition cases, the Service is required by law to offer 100 percent of the property's appraised market value, as set out in an approved appraisal that meets professional standards and Federal requirements.

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Planning for the acquisition of land, water, or other interests is initiated with the identification of a need to meet resource objectives that require a real property base. At Lower Hatchie Refuge, a team of biologists, planners, and realty specialists evaluated myriad factors, such as fish and wildlife resources, land use, threats to resource values, socioeconomic considerations, and cultural resources, to determine the original refuge boundary in 1985 (USFWS 1985).

In 2000, an expanded acquisition boundary was approved, which could potentially increase the size from 9,107 acres (as of July 2000) to a potential 23,439 acres. The recommendations in the Proposed Expansion of Chickasaw and Lower Hatchie National Wildlife Refuges (USFWS 2000) define important and sensitive areas that could be protected and managed as part of the Refuge System. The plan proposal was eventually forwarded to the Director of the U.S. Fish and Wildlife Service for approval. During the review of the draft plan, the public was given opportunities to comment on and respond to the proposed plan.

Once the expanded refuge boundary is approved and funds are available, the Service proceeds to contact all landowners within the new boundary to determine if there are any willing sellers. If a landowner expresses an interest in selling lands to the Service, a professional real estate appraiser conducts an appraisal to determine the fair market value of the property. Once the value is determined, a meeting is held with the landowner and the Service presents its offer. If the landowner agrees with the offer, the purchase agreement is signed and the process of acquiring the land is set in motion.

As of June 1, 2004, land acquisitions within the approved acquisition boundary have resulted in a Lower Hatchie Refuge acreage of 9,451 acres. In acquisition considerations, lands adjacent to Service-owned lands within the existing refuge boundary and larger contiguous forest tracts (inside or outside the current acquisition boundary), and marginal farmland, are given the highest priority.

The acquisition methods that could be used by the Service are described as follows:

### **1. Leases and Cooperative Agreements**

Potentially, the Service can protect and manage habitat through leases and cooperative agreements. Management control on privately owned lands can be obtained by entering into long-term renewable leases or cooperative agreements with the landowners. Short-term leases can be used to protect or manage habitat until more secure land protection can be negotiated.

### **2. Conservation Easements**

Conservation easements give the Service the opportunity to manage lands for their fish and wildlife habitat values. Such management precludes all other uses that are incompatible with the Service's management objectives. Only land uses that would have minimal or no conflicts with the management objectives are retained by the landowner. In effect, the landowner transfers certain development rights to the Service for management purposes as specified in the easement. Easements would likely be useful when: (a) most, but not all, of a private landowner's uses are compatible with the Service's management objectives, and (b) the current owner desires to retain ownership of the land and continue compatible uses under the terms set by the Service in the easement. Land uses that are normally restricted under the terms of a conservation easement include: (a) development rights (agricultural, residential, etc.); (b) alteration of the area's natural topography; (c) uses adversely affecting the area's floral and faunal communities; (d) private hunting and fishing lease; (e) excessive public use and access; and (f) alteration of the natural water regime.

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### **3. Fee Title Acquisition**

A fee title interest is normally acquired when (a) the area's fish and wildlife resources require permanent protection not otherwise assured; (b) land is needed for visitor use development; (c) a pending land use could adversely impact the area's resources; or (d) it is the most practical and economical way to assemble small tracts into a manageable unit. Fee title acquisition conveys all ownership rights to the Federal Government and provides the best assurance of permanent resource protection. A fee title interest may be acquired by donation, exchange, transfer, or purchase.

Funds for the acquisition of lands for Lower Hatchie Refuge will likely come from the Land and Water Conservation Fund or the Migratory Bird Conservation Fund. Sources of revenue for this fund include Federal Duck Stamp sales, refuge entrance fees, fish and wildlife fines, import taxes on arms and ammunition, offshore oil and gas leases, and Congressional appropriations.

Lands acquired by the Service are removed from the tax rolls. To offset the fiscal impact associated with the removal of these lands from the public tax rolls, the Refuge Revenue Sharing Act of 1935, as amended in 1978, provides for payments in lieu of taxes. Revenue-sharing payments for the county would compare favorably with current tax rates. If fully funded, the revenue-sharing rate is 1 percent of the fair market value of a property. For lands purchased by the Service, the following formulas are used to determine the annual payment amount to the county. Payment for acquired land is computed on whichever of the formulas yields the greatest result: (1) three-fourths of 1 percent of the fair market value of the lands acquired in fee title; (2) 25 percent of the net refuge receipts collected; or (3) 75 cents per acre of the lands acquired in fee title within the county.

Lands subject to refuge revenue-sharing payments are reappraised every 5 years. The appraisals set the fair market value of the land, based on the highest and best use. The appraised market value of the fee title lands within the refuge, and thus the revenue-sharing payments, would change over time in relation to the changing value of non-refuge lands.

The Service's proposed action (Alternative D) could result in the acquisition of up to 23,587 acres of wildlife habitat as an expansion of Lower Hatchie National Wildlife Refuge, through a combination of fee title purchases and/or donations from willing sellers and less-than-fee interests (conservation easements, cooperative agreements) from willing landowners. The Service believes these are the minimum interests necessary to preserve and protect the fish and wildlife resources in the proposed area.

The private property has been prioritized for acquisition using the following criteria:

- Biological significance;
- Existing and potential threats;
- Significance of the area to refuge management and administration; and
- Existing commitments to purchase or protect land.



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## *Appendix VII: Public Involvement/Consultation and Coordination*

In order to inform and solicit ideas from the public during the planning process, a number of different means was used.

A notice of intent was published in the Federal Register prior to the initiation of the planning process. Local publicity was provided by newspaper interviews and radio interviews early in the planning process and prior to public scoping meetings. Presentations were given at west Tennessee rotary clubs and at Friends of West Tennessee National Wildlife Refuges meetings, as well as Service Ecoteam meetings and planning workshops.

Prior to the first public scoping meeting, mailings were sent to about 150 persons, media representatives, local officials, and agencies providing information about four upcoming open house/scoping meetings to be held in the west Tennessee area. Flyers were posted in local communities, and newspaper articles and radio interviews advertised the upcoming meetings and the comprehensive conservation planning process. A public open house/scoping meeting was held on October 26, 2000, in Covington, Tennessee, in which attendees were provided an opportunity to learn about the refuge's purpose, mission, and goals, as well as issues and opportunities currently facing refuge management. The comprehensive conservation planning process was also described and attendees had the chance to provide oral and/or written comments to be considered in the development of the plan. Attendees at the scoping meeting were provided a sign-up sheet for a planning mailing list, a written questionnaire, and opportunities to give public comments and ask questions, both in the scoping meeting as well as to managers at the open house.

All mailings, presentations, interviews, and meetings provided instructions as to how public input could be provided for the planning process. Throughout the planning process, comments were received by telephone, personal visits, e-mail, and mail.

In addition to public outreach and scoping meetings, a Planning Review Group was developed, consisting of representatives from Ducks Unlimited, local community colleges, Tennessee Wildlife Resources Agency, The Nature Conservancy, Anderson Tully Company, Friends of West Tennessee National Wildlife Refuges, Tennessee State Parks, the U.S. Geological Survey, as well as local officials, farmers, and landowners. This group met and was provided an overview of the planning process. They continued to provide comments during the process and were looked to for input on various sections of the plan as it was written.

### *PUBLIC SCOPING COMMENTS*

A summary of individual comments received during the scoping process is listed as follows:

- Water sources for impoundments, more moist-soil habitat, availability and management of cropland.
- Federal acquisitions of private lands, more information to the public, better management of existing holdings prior to additional acquisitions (Take Care of What We Have First).
- Provide more hunting and fishing opportunities.
- Provide more wildlife viewing and photography opportunities.
- Provide a boat ramp to the Hatchie River or Mississippi River.
- Provide and/or maintain trails and roads for improved access.

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- Need for more assessment and inventory of refuge plants and animals.
  - Address “public opposition” to killing of wildlife on national wildlife refuges.
  - Develop “humane and socially acceptable” predator management strategies to protect threatened and endangered species.
  - Assess and mitigate impacts of recreational activities on plants and animals.
  - Examine the emphasis on management for particular species/groups.
  - Need for a thorough discussion of proposed refuge habitat management practices.